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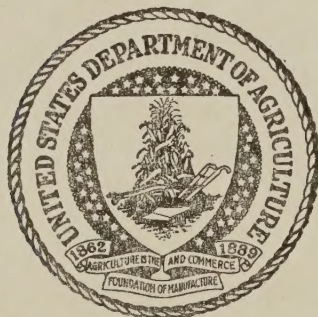
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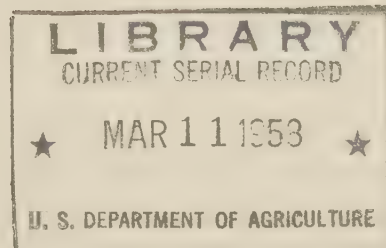
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DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

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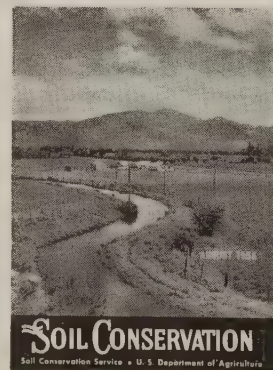
INVESTMENT IN PINE WOODLAND.

—Jack White, a cooperator with the West Georgia Soil Conservation District, bought 14 acres of eroded land in Meriwether County for \$295 in 1937. He planted an acre of slash pine seedlings during the latter part of December that year. The planting was on a cottonfield that had failed to make a satisfactory crop. The field is class II land—Cecil soil.

During the fall of 1951, White noticed that about 5 percent of his trees looked sick. They had knots on the trunks and limbs. He marked the diseased and crooked trees and sold them for pulpwood. From the 1 acre 7.5 units of pulpwood were cut that brought \$26.25.

In November 1955 the Soil Conservation Service talked to White about D+6 thinning, and advised him that the slash pine on the acre should be thinned. Again White marked his trees, this time on a D+6 thinning basis. In December 1955 he sold 7.8 units of pulpwood for \$27.30. White now values the stand of slash pine on this 1 acre at \$150.

On land that cost \$27.85 per acre in 1937, White has received \$53.55 in 17 years, or \$3.15 per acre per year. He still has a crop that he values at \$150 and his original investment in the land.



FRONT COVER—Sprinkler irrigation of alfalfa and brome grass pastures near Twisp, Wash.

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Starting From Scratch

Eight old farms are combined into one to make the new University of Wisconsin experimental farm with a new conservation plan

By DOUGLAS D. SORENSON

THE long sweeping curves of contour strips and terraces will replace the patchwork pattern of rectangular fields on eight adjoining farms in the Columbia County Soil Conservation District of Wisconsin.

The farms, which cover 1,170 acres, have already lost their individual identities and have been combined into one unit which will be the new University of Wisconsin experimental farm. Eventually, the University Farm may cover some 2,500 acres.

The new farm is about 20 miles north of Madison on the fertile, rolling Arlington prairie. It will take the place of the old Hill farms which will become Madison residential areas.

The conservation-minded experiment station staff recognized the opportunity for conservation planning "starting from scratch" on the new area. R. K. Froker experiment station director, made an agreement with Columbia County Soil Conservation District officials to cooperate in the conservation plan for the farm. Even before the University actually had possession of the area, farm planning began.

Harold Krueger, Soil Conservation Service representative of the Columbia County Soil Conservation District, surveyed the area and prepared a land use capability map as the first step.

R. J. Muckenhirn, assistant station director, and V. W. Matthias, farm manager, with Krueger used the map to plan the best use of every acre of the new farm.

Intensive cropping in contour strips or terraced fields is planned for the gently sloping parts of the farm. The more rolling slopes will be in grass most of the time and used for pasture and dairy experiments. Wildlife will find permanent cover in a few acres of rough land

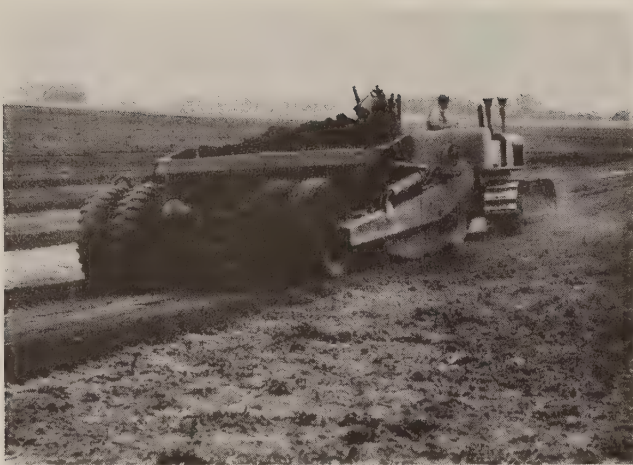
which will be undisturbed by the plow or grazing farm animals.

After the planning of land use, actual face-lifting of the 1,170 acres began. Line fences were torn down and old field boundaries eliminated before construction equipment moved in. Strips and terraces were laid out to follow nature's contours across old fields and fence lines. Construction equipment came from the Columbia County Soil Conservation District and was loaned to the University at cost, under the same plan offered to farmers in the district.



The principals in planning the conservation work for the University of Wisconsin experimental farm are shown here (left to right): V. W. Matthias, farm manager; R. J. Muckenhirn, assistant director of the Experiment Station; Harold Krueger, SCS work unit conservationist; and Jack Densmore, SCS state conservationist.

Note.—The author is a graduate student in the Department of Agricultural Journalism, University of Wisconsin, Madison, Wis.



One of the earth movers used in building 7 miles of terraces, diversions, and waterways on the 1,170-acre University of Wisconsin experimental farm.

By the fall of 1955, patrol graders and earth-movers had carved out almost 7 miles of terraces, diversions, and grass waterways. This was more than all the rest of the terracing done in the district that year. Conservation construction was planned so that when adjoining land is added to the experimental farm, it can become a part of the present erosion control plan.

The new farm is located in parts of three townships in Columbia County and Dane County Soil Conservation Districts. The Columbia district did all the conservation work in both counties.



Harold Krueger inspects a newly completed terrace that cuts across old fence lines that used to separate the eight farms now combined into one unit.

Moving of livestock and turkeys to the farm began this spring, and University farm crews are already busy with field work for 1956. This year they'll plant nearly 500 acres of corn and 400 acres of oats on the level land and terraced slopes. Hay and pasture will make up another 200 acres, and the rest of the tillable land will be planted to soybeans to build up soil fertility.

There's other important work to be done this year before the farm will be ready for full-scale operation. Grass waterways have been seeded, and an extensive weed control program is underway.

By 1957 a brand new farm will be operating with the best known soil, water, and wildlife conservation practices.

REACHES BEYOND THE SCHOOL

A Vo-Ag teacher not only teaches soil conservation to his high school students, but also preaches it to everyone in his own and neighboring counties, and practices conservation on his own farm.

By CHARLES B. S. SLATON

CHARLES HESS believes in soil conservation. He teaches it, he preaches it, and he practices it.

He teaches it in his vocational agriculture high school classes at Mansfield, Pa. He's the school's supervisor of agriculture. He preaches it to anyone who will listen, and is often invited to talk before various groups. He practices it on his 60-acre farm.

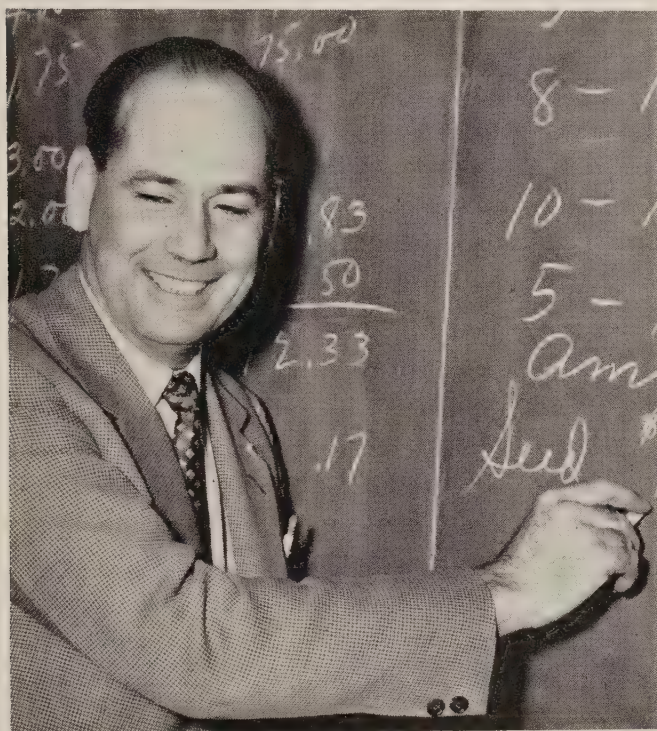
Hess has been interested in farming most of his life. He spent his summers on a farm till he was 8 years old. Then his family moved to the farm. As soon as they were old enough, Charles and a brother took over operation of the farm.

Charles continued his interest in farming at college. He studied dairying, then changed to agricultural education at Pennsylvania State

Note.—The author is work unit conservationist Soil Conservationist Soil Conservation Service, Wellsboro, Pa.

College where he graduated in 1933. Without delay he got into vocational agricultural teaching.

Hess says he became aware of conservation as a distinct way of farming in 1939. That was the year he started a vocational agriculture department in the Scott Township High School, Lackawanna County, Pa. One day he went out to talk to a farmer, Harold Snyder. He found Ted Hebel, Soil Conservation Service technician, talking with Snyder about a conservation program for his farm. He noted what Hebel said about conservation.



Charles Hess

"I was greatly impressed by Snyder's attitude," Hess recalls. "After outlining the conservation practices that would make up his program, he said, 'These practices might not help me but I'll be able to pass on a better farm.' I don't think I'll ever forget that noble thought."

No radical change came over Charles Hess. But from then on he was more aware of soil and water conservation than ever before. When he went to Mansfield High School in 1941, he took steps to get acquainted with Soil Conservation Service workers and the county agent. He went out on the farms with these men. The SCS men showed him how to apply certain con-

servation measures. Then Hess started taking his students out on the farms. He showed them how erosion destroyed the land, how conservation saved it. He showed them how conservation measures got the most use out of water. Hess told his students about differences in soils and classes of land out on the farms where they could see for themselves.

He weaves soil and water conservation into all his teaching. All phases of the whole conservation program are brought naturally into his courses. "Sometimes farmers turn to conservation farming because of the influence of their sons," he says. "The boys learn about it in vo-ag classes. They see the need and the value of it. They keep on talking about it at home until their parents become interested."

Hess has been president of the Cory Creek Watershed Association since it was formed in 1953. (Cory Creek is a pilot watershed project.) He helps to prepare exhibits on conservation for the county fair each year. He talks on conservation regularly before such groups as the Mansfield Businessmen's Association, the Pennsylvania State Association of Soil Conservation District Directors, the Potter County Soil Conservation District Forum, the Grange, the Cowanesque River Watershed Association, and the Future Farmers of America.

He is an honorary Keystone Farmer. His vo-ag boys have won national FFA awards, as well as local and state honors.

Hess was master of the student subordinate Grange while he was in college. He is a past president of both the Tioga County and the State Agricultural Teachers Association. In 1953 he formed the Mansfield Young Farmers Association. In all of these he helps his Tioga County Soil Conservation District and all other districts by arousing interest in the conservation of soil and water resources.

AUSTRALIA FINDS CONSERVATION PAYS.—It is quite feasible to double the output from crops and stock and farm timber at low capital cost, from all the eroding arable farms in the western slopes of New South Wales by land use, planning, and soil conservation farming. We know this can be done because it has been done on so many representative farms from the Victorian to the Queensland border.

—L. G. KALESKI
Chief Soil Conservationist
New South Wales

Soil Nitrogen Balance Sheets

No. 16

This is the sixteenth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By FRANKLIN E. ALLISON

WHEN fertilizer nitrogen is added to cultivated soils in the humid region of the United States usually less than 50 percent is recovered in the harvested crop. Low recoveries are due in part to the nitrogen left in the roots and other unharvested portions of the crop. But even a second crop, planted the following year, will not appreciably increase the recovery figures unless drought prevented the satisfactory utilization of the nitrogen added the previous year.

Many experiments have shown that if the added nitrogen is in the form of animal manures the recovery in the first crop is not likely to exceed 25 percent. In this case there is a residual effect because much of the nitrogen was not changed to nitrates the first year. But even after several years of cropping one cannot expect to obtain more than a third of the manure nitrogen in the harvested crops.

The recoveries of added nitrogen applied to crops in the drier regions, where leaching is not a factor, are probably higher than those given above but present information is too limited to justify a positive statement to that effect.

Research workers in the Agricultural Research Service have been trying to find out more quantitatively what happens to the "lost" nitrogen. If soil nitrogen balance sheets don't balance, what is the reason? In attempting to answer this question it is necessary to consider all of the channels by which nitrogen gets into the soil and those by which it leaves.

The main sources of crop nitrogen, apart from soil organic matter, are rainfall, irrigation water, seeds, animal manures, crop residues, fertilizers, legumes, and free-living nitrogen-fixing microorganisms. In any given experiment, specifically designed for the purpose, all of these nitrogen sources, except the last, can be determined or estimated rather accurately. Nitrogen fixation by nonsymbiotic microorganisms may vary from nothing to as much as 40 pounds per acre annually. The quantity is usually small; in fact, it can't be measured accurately except by the use of tracer techniques, and then only under laboratory or greenhouse conditions.

The main sources of nitrogen loss, apart from harvested crops, are erosion, leaching, and gaseous diffusion. Experimentally, erosion can be eliminated; and by the use of tanks provided with drainage (lysimeters) the leaching losses can be determined accurately. Values so obtained are likely to be too high, though, because water penetration into soils kept in tanks is probably greater than in field soils, especially if the topography is rolling. Although such a limitation needs to be kept in mind it is of minor importance in nitrogen balance studies.

A summation of such lysimeter data shows that of the nitrogen not recovered in the crop, the larger part escapes from the soil by leaching. The quantity so lost varies widely with the crop and soil. Another considerable portion of the added nitrogen escapes as gases. In the experiments studied, an average of about 20 percent of the nitrogen added to cropped soils was not accounted for; presumably most of it escaped as gases. The corresponding loss from uncropped soils was about 12 percent. The losses were, of course, even larger if much nonsymbiotic nitrogen fixation occurred.

These studies emphasize that low recoveries of nitrogen in the crop were obtained where large additions of nitrogen were made, where the soils were very sandy, and where the crop was not adequate to assimilate most of the fertilizer nitrogen soon after its addition to the soil. The amount of the unaccounted for nitro-

Note.—The author is soil scientist, soil and water conservation research branch, Agricultural Research Service, Beltsville, Md.

gen was approximately the same whether the nitrogen was added as nitrate, ammonia, or high grade organic materials.

Recent experiments in several laboratories have shown clearly the chemical nature of the gaseous forms of nitrogen that are lost from soils, and the soil conditions that favor such losses. These gaseous forms of nitrogen are chiefly ammonia, molecular nitrogen, and nitrous oxide.

Ammonia is likely to escape from soil if it is slightly or strongly alkaline, but not if it is acid. Such losses are greater if the ammonia is near the surface and the soil is allowed to dry. Ammonia losses increase with soil temperature and are larger from sandy than from clay soils. Ammonia may also escape readily if nitrogenous organic materials are allowed to decay on or near the soil surface. Considerable volatilization of ammonia may occur from animal manures if they are spread on the soil sur-

face and not incorporated into the soil. The loss is not appreciable unless the nitrogen content of the dry matter is above 2 percent.

Both molecular nitrogen and nitrous oxide may be produced in considerable quantity as a result of the activities of denitrifying bacteria. These common soil organisms, which ordinarily obtain their oxygen supply from the air, can also take it from nitrites or nitrates if the air supply is restricted. In the process they liberate free nitrogen gas and also nitrous oxide as by-products. Deficient soil aeration is most likely to result from temporary water-logging or heavy applications of organic matter.

Most losses of gaseous nitrogen from soils are believed to be the result of this bacterial denitrification process. The liberation of both nitrogen gas and nitrous oxide can begin to occur within a few hours in warm moist soils if the oxygen supply becomes deficient when nitrates are present. Some losses of these two



Experiments show that in a field like this the sod crops use a considerably higher percentage of the nitrogen fertilizer applied than do the cultivated crops.

gases may also occur as a result of chemical reactions but work done in the Agricultural Research Service laboratories shows that such losses are small.

A few organic substances such as methylamine and trimethylamine, hydrocyanic acid, and nicotine are known to escape from growing plants but these losses are insignificant.

Little emphasis has been placed on loss of nitrogen through erosion but these losses may be as great as those due to leaching if proper control measures are not taken. Eroded soil contains considerably more nitrogen than the soil left behind due to its higher clay and organic matter content.

These nitrogen balance studies emphasize that in order to obtain a high efficiency in the use of nitrogenous fertilizers it is desirable to apply the nitrogen as short a time as possible

before the crop is ready to assimilate it, thereby reducing the chances of losses both by leaching and by denitrification. Ammonia-nitrogen, if applied to alkaline soils, should be incorporated with them. Where nitrogen is applied to a sod the recovery in the crop may be considerably above the 50 percent mentioned since a grass sod assimilates available nitrogen very rapidly.

Any chemical nitrogen not utilized the season that it is applied will, ordinarily, under humid conditions be almost completely removed before the second season arrives. It can be held in the soil only by supplying sufficient quantities of carbonaceous materials to enable the soil microorganisms to tieup the nitrogen in an organic form. Even if so fixed, the fixation will be temporary unless the carbon level is permanently raised. This can be done by shifting from cultivated crops to sod crops but it is difficult to do otherwise.

Range Production Doubled

A Southwestern rancher bought an overgrazed range and by decreasing the number of cows, installing conservation measures, and practicing good grazing management almost doubled the beef production.

By PAUL E. ELLSWORTH
and KEITH J. DAMPF

IN August 1945, when Buford Slover bought a 24-section ranch, 60 miles southwest of Lordsburg, N. Mex., the grass was short and the cattle were poor—there were no permanent waters on the place. There were four pastures; all fences, including the outside boundary fences, were in poor condition. The grass was in poor condition at that time, but had good potential for improvement with good grazing management. Slover says he tried to see beyond the short grass and lean cattle to fat cattle on luxuriant grass; to making the ranch pay better—and he has seen the vision come true.

Slover's first job, when he bought the ranch, was to take inventory of the grass and cattle. A trip to Soil Conservation Service headquar-

ters at Lordsburg brought help from SCS technicians in making a range forage inventory.

Being an expert at watching cattle to see when they get enough feed, it was easy to become expert at watching grass. The poor condition of the range told Slover that there were too many cattle on the ranch. He could see that there was no use in having 2 cows where there was only grass for 1. After taking inventory of his grass, he cut the number of breeding cows from 300 to 250 head.

The 300 cows on the ranch had 185 calves, about 62 percent of the cows having calves in 1945. The cows averaged 900 pounds, and at marketing time, (November 1, 1945) the calves averaged 370 pounds each. In 1953, with 250 cows, the cows averaged 1,026 pounds each and 97 percent of them produced calves. These

Note.—The authors are, respectively, work unit conservationist and farm planner, Soil Conservation Service, Lordsburg, N. Mex.

calves averaged 491 pounds each on November 1. In 1955, with 250 cows a 97 percent calf crop was again produced, averaging 470 pounds per calf.

Total weights of calves produced in 1945 was 68,450 pounds; in 1953, 119,313 pounds; and in 1955, 116,761 pounds. This meant an increase of about 70 percent in the market weight of calves produced on the ranch.

"It is not the number of cattle that counts," says Slover, "It is the number of pounds of beef produced."

Slover used a system of deferred grazing, where one part of the ranch was grazed during the growing season, leaving the remainder to rest during this period. The following year another part of the ranch would be grazed during the growing season.

"A cow will select the more palatable grasses to eat if you let her," says Slover. "By grazing only a part of the ranch during the growing season the cow must eat some of the less palatable grasses, while the remainder of the ranch is getting a rest."

To practice the system of deferred grazing and control extra fencing was needed. Seven miles of new division fences were built to increase the number of pastures from 4 to 9.

To properly utilize the available grass, sufficient water was needed in each pasture. Four



Buford Slover and Paul Ellsworth examine the grass in one of Slover's pastures.

wells were drilled and equipped with storage tanks with steel rims and concrete bottoms. Also, Slover constructed 14 earthen dams and 18 masonry or concrete dams to form stock water ponds and reservoirs. The masonry or concrete dams are located in the steep, rocky parts of the ranch.

In addition, water was piped from a masonry dam $1\frac{1}{2}$ miles to the headquarters and on to a pasture $\frac{3}{4}$ mile beyond.

Slover considers fencing and water development as grazing management practices, since they are necessary to proper distribution and control of the cattle.



One of the 14 ponds on the Slover ranch.

"The extra watering places were needed so the cattle wouldn't have to walk themselves to death going to and from water. My cattle do not have to walk more than a mile to water anywhere on the ranch," Slover stated. "A rancher needs water and fences to control and guide his cattle so that all of the range can be utilized and the use can be controlled on all of the range. I wouldn't be a very good rancher unless I knew more than a cow."

Erosion control dams built by Slover have aided in speeding up the revegetation of bare spots on the ranch. Slover's knowledge of cattle has helped him to control grazing and to keep the animals in vigorous condition at all times. To do this, he knows that it is essential that he have forage at all times for the cattle.

Being a good cattleman, Slover observes the condition of his cattle, and attributes their condition largely to the feed they are eating. If the condition of the stock is not satisfactory then he assumes the feed is not satisfactory, so he adjusts the management of the stock to give the improvement needed in the forage.

"An overgrazed area," explains Slover, "has very little stubble on it. The grass makes little growth. If the grass is short, the roots are also short, as the top has to manufacture the food from the water and elements that the plant gets from the soil. When the roots are poorly developed they cannot pick up the deeper moisture in the soil. Grass eaten down to the ground has no depth to its roots, it is weak, and noxious or worthless plants invade the pasture. With a good grass cover the ground is cooler and less water is lost from evaporation. The grass cover also holds the rainwater longer and gives the ground more time to soak up the water."

Slover's objective, when he bought the ranch, was to increase and maintain his income at a high level. He felt that the way to do this was to put conservation on the land to increase the forage production, and finally this would result in more beef production and thereby increase his income.

The weather was dry, the land was steep, the grass cover was thin. The weather, the soil, and the topography could not be changed. To increase the grass it was necessary to increase the amount of water taken into the soil and decrease the runoff. The logical way to do this

was to adjust the stocking rate each year to the amount of grass available and give the grass a chance to make a better cover on the land.

Slover had found that well fed cattle are thriving, profitable cattle. This interest in contented cows with full paunches led to his interest in feed to keep them that way, and further to the improvement of the range condition and sustained grass yields.

In managing grass, Slover's idea is to take some and leave some. He says, "I try to keep a little of the old grass ahead, so that when the dry years come along I won't get caught in too bad shape. I fought the drought years by keeping the number of cattle down to where the place would run them without me buying too much feed."

This is not a story of rags to riches, nor a get rich quick scheme of overnight miracles. It is, however, a revelation of what a rancher could and did do with a rundown ranch that had poor grass and skinny cattle.

SELECTIVE CUTTING OF WOODLANDS INCREASES INCOME.—Mack L. Gill, a retired hardware salesman, now 72 years old, has lived for several years on his 1,067-acre tree and cattle farm, in Lincoln Parish, La. Part of his farm has been owned by the family for 135 years and part was purchased recently. The Gill farm has about 220 acres of improved pasture and 847 acres of woodland. The woodland occupies about 767 acres of uneven-age loblolly and shortleaf pine and about 80 acres of creek bottom land that has loblolly pine mixed with oak, gum, and cypress.

The past 9 years Gill has managed his woodland as a crop. He selectively cuts 100 to 200 acres each year. His woodland is divided into 5 compartments to correspond with the cutting cycle. Each compartment contains about 170 acres. Compartments "A" and "B" were selectively cut for the second time in 1954, and 1955. The products harvested were poles, pine and hardwood saw logs, and pulpwood. The total amount received from stumpage sales the past 2 years averaged \$4,000 per year.

Gill stated, "I am well pleased with my woodland conservation compartment plan. It gives me a definite area to work each year. My plan, based on D+6 spacing plus one crop tree per acre per year, will allow me a selective cut each year from now on. Also, I expect my son to take over eventually and this plan will make it easier for him."

The Louisiana Tree Farm System awarded Gill a tree farm certificate and sign in 1952 in recognition of the excellent woodland protection and management program that he has been observing for many years.

Roses on the Contour

A nurseryman and soil conservation district director practices what he preaches by using good soil and water conservation practices

By JOHN O. DEAN

WALT MATLIN has been telling his neighbors in the west end of Riverside and San Bernardino Counties, Calif., that soil and water conservation is very important. He acted as chairman of the organizing committee, when the West End Soil Conservation District was being organized. He has been a director of the district ever since it was organized. Walt practices what he preaches on his own land and upon land that he leases. He says that it only makes sense because soil and water conservation pays.

The Matlin Nursery which specializes in

Note.—The author is area conservationist, Soil Conservation Service, Riverside, Calif.

growing hybrid tea roses, has done an outstanding job of soil and water conservation on leased land in the Riverside-Corona Soil Conservation District. From 60 to 70 acres of rose plants are harvested and sold each year. Altogether, more than 200 acres are devoted to the rose nursery, because the roses must be rotated to avoid soil infestations.

All of the nursery is on hillside land. Every furrow on the property is on a grade contour.

The curved pattern of planting makes irrigation easy and efficient. Erosion is reduced to a minimum and the roses are producing lush growth. The curved rows of colorful roses make a beautiful sight. They are equally as beautiful on the nursery as they eventually will be in some fine rose garden.



Contour planted roses on the Matlin Nursery.

Cooperation on a Watershed

The neighbors of Smock Valley, Wis., find their small watershed improvement project an adequate substitute for the oldtime threshing ring.

By A. B. FOSTER

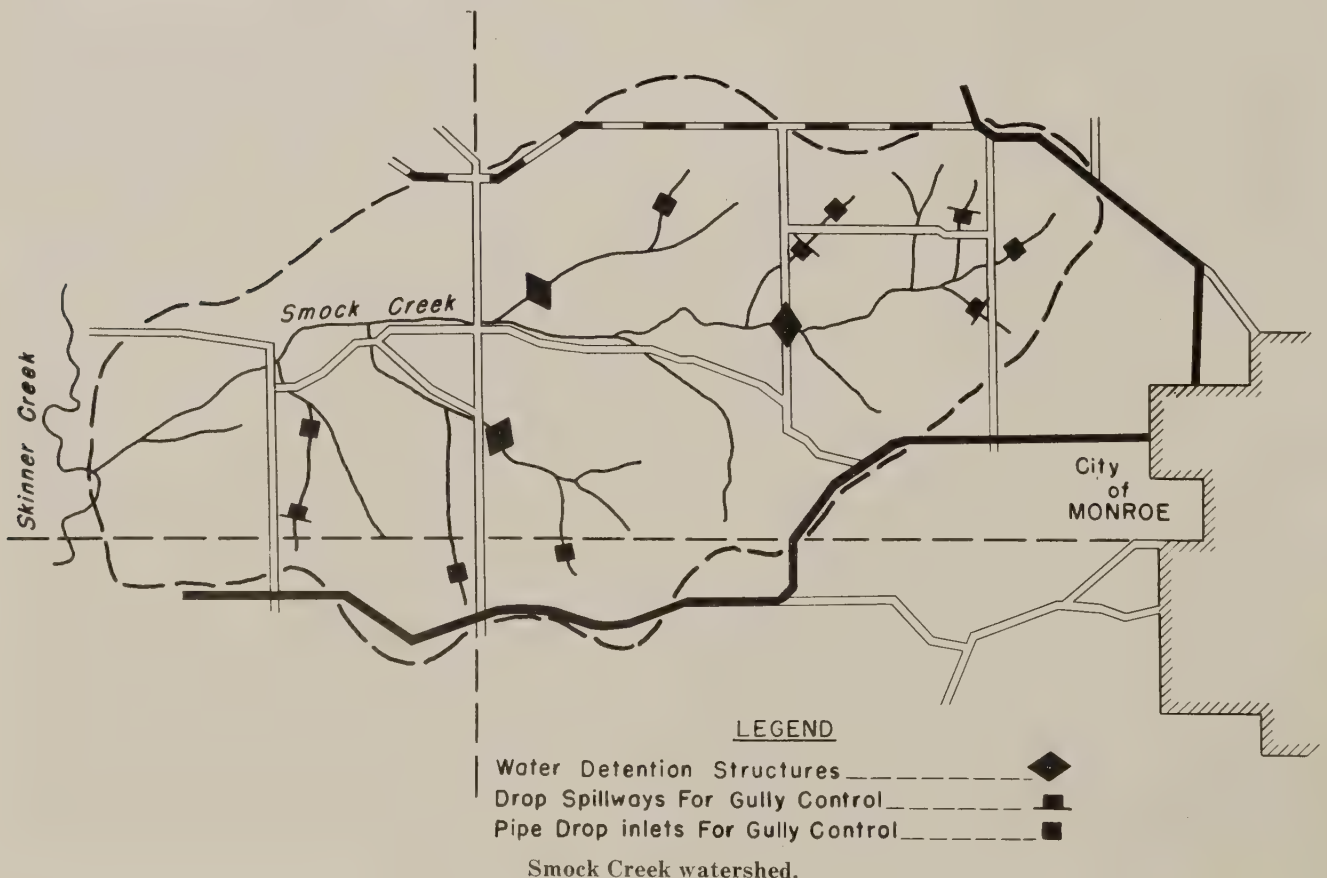
"PEOPLE have to see to believe. This is what makes neighboring so effective in getting soil conservation work on the land." Ken Digman, young farmer in Green County, Wis., is talking. Ken was one of the leaders in organizing the Smock Valley Watershed Association, a going concern in the Green County Soil Conservation District.

"A neighbor can show results, where a government technician may not be able to convince a farmer that conservation farming is best," Ken says. "How will it work on my farm?" is the first thing most farmers want to know, and a neighbor is the one who can tell him."

"We need technical help, make no mistake about that," Ken continued. "You can't make

water run uphill. We need technicians who can run transits and levels as well as help with making complete farm conservation plans. But there's a job that local people have to do themselves. What makes me feel good is to see these other fellows take hold of the thing and make it go—fellows who were a little reluctant at first."

Smock Valley is the name the people have given to the 5,500-acre watershed just west of Monroe, Wis., where 52 farms drain to a common stream, the Smock. It borders on U. S. Highway 11 on the south and is about 5 miles long and 2 miles wide. Sheet and gully erosion on the uplands and too much water on the lowlands are the main problems.





Ken Digman and son, Aaron, ear-marking a new litter of pigs.

Tommy Schuetz, another young farmer, is now president of the watershed association. Like Digman, Tommy believes that association makes for cooperation with neighbors. He pointed out that the old threshing ring is gone, people no longer butcher together, so neighbors have tended to become strangers to each other. Watershed association meetings are taking the place of the old threshing ring.

The association was organized in 1952. At first, only men came to the meetings. Then the women came but had their own meeting in another room. Now they meet together and bring the whole family. Even the kids ask, "Is this watershed week?" when Friday night rolls around.

It all started in 1951 with a neighbor group meeting where one farmer invited his neighbors into his home to talk over soil erosion problems. Tommy Schuetz attended that meeting. Ken Digman was the leader of the group.

"Those group meetings helped straighten me out," Tom said. He was referring to a soil conservation program and how he could live with it. For example, how could he get enough pasture for his dairy herd if he put the cropland in strips. Nick Calabresa, local Soil Conserva-

tion Service technician, came to these early meetings and explained how a crop rotation could be arranged so that fields could be pastured without a lot of fencing problems. "We got acquainted with Nick and got confidence in him," Tommy pointed out. Don Digman, brother of Ken, Emmanuel Fuchs, Bill Leopold, Cy Amacher, Roy Block, Bill, Walter and Albert Schuetz, Ernest Steinman, Tom and Clarence Steiner were in the original neighbor group meeting.

After 5 of these neighbor meetings, where an average of 15 farmers from various parts of the watershed met, conservation plans were put in practice. It wasn't long until some of the farmers began to see the advantages of the conservation work. It began to show up in the depth of the main creek during hard rains. It just didn't run so deep. Where Digman lived, you could really see it. So the group talked about how to get others in the watershed in on the plan and to get the benefits as well as to make the whole scheme work better.

This original group divided up a list of the remaining farmers in the watershed and went to see them personally. The result was a meeting at the Hiawatha School with 40 farmers present. The Hiawatha School is right at the top of the watershed.



Tommy Schuetz dragging a red oak log from his 50-acre woods.



Nick Calabresa, SCS technician, (left) and Emmanuel Fuchs checking the conservation plan of Fuchs.

They organized the association at this meeting. The boundary of the watershed was outlined, some bylaws were set up, and five directors were elected.

After this election the directors met and set up a program. County Agent Myron Jeglum and SCS technician Nick Calabresa were there. So was Ken Allen, the vocational agriculture teacher, and Clarence Benkert of the Wisconsin Conservation Department. Meetings were held once a month for awhile. The SCS made an engineering review and listed the needed conservation measures on the watershed. Among other things, they learned that, in addition to the regular soil conservation programs on the farmland, some large structures were needed. These have been spotted on a map of the watershed showing their probable location. Just when and how these structures will be built has not been worked out but none of the members of the association doubts that they will be built.

Emmanuel Fuchs is a beef cattleman who has a 140-acre farm along the south-central part of the watershed. Emmanuel is a cooperator with the Green County Soil Conservation District and a director of the Smock Valley Watershed Association. He is still working on his waterways. He has 4 to shape and seed and has 3 of them finished. Just as Tommy Schuetz and Ken Digman had pointed out, Emmanuel believed that the social part of the watershed

association had as much to do with its success as any one thing. He couldn't help noticing that people work out their conservation problems together a lot easier after they get to know each other. And all this in spite of the competition from television.

The success of the Smock Valley association has been contagious. Between 20 and 30 farmers who live outside the physical boundaries of the watershed have asked to join. It appears that they will either combine their efforts or, with the help of the Smock Valley directors, will organize an association of their own.

It will be interesting to see if the watershed association will replace the threshing ring. Judging by the feeling of a lot of farmers in Green County, it already has.

A SUPERVISOR WITH A RADIO PROGRAM

By M. B. BRISSIE

"**A**ND now here is Vernon Grant with his weekly interview," are the words of the announcer over radio station WRHI, Rock Hill, S. C., at 12:50 p.m., each Tuesday when Grant talks "shop" with outstanding soil and water conservation farmers. Grant is a supervisor of the Catawba Soil Conservation District.

Preceding this announcement, the "American Song of the Soil" has just been broadcast from a recording by three girls from nearby Winthrop College. The program has been a regular feature over WRHI for 4 years.



Vernon Grant (right) interviews W. B. Wilkerson, Jr. while a tape recording is made.

Grant usually asks leading questions to bring out some of the results the soil conservation district cooperators have achieved in applying sound soil and water conservation practices with assistance from the district. He believes that his spot on the program is good, since most farm people as well as town people are around the dinner table at the broadcast hour. Many requests for technical help have come to the local soil conservation district office after one of Grant's broadcasts.



Winthrop College students recording the "American Song of the Soil."

Once each month the radio station sends a representative with a tape recorder to one of the farming areas in the district where supervisors and Soil Conservation Service technicians have cooperated to bring in local farmers who have a story to tell about soil and water conservation. At these gatherings Grant usually prepares sufficient tapes to use during the coming month.

This program had its beginning in 1952 when the supervisors of the District began the "Farmer of the Week," program by designating one outstanding conservation farmer each week and inviting the other farmers as well as businessmen to visit the farm during that particular week. Wednesday afternoon is designated as the time most appropriate for the visits.

Local Teamwork

A discussion of how county ASC Committees and SCD supervisors may cooperate to get more conservation for the money expended.

By THOMAS L. AYERS

THE Agricultural Conservation Program is administered nationally by the ACP Service of the USDA and in States and counties by Agricultural Stabilization and Conservation Committees. This program has a major role in Federal Government assistance to help farm people establish sound systems of soil and water management.

More than 90 percent of the farmland of the Nation is now in districts. The governing bodies of these districts have as major responsibilities the determination of (1) the kind and extent of conservation problems, (2) the needed changes in land use, and (3) the necessary conservation practices to solve the conservation and land use problems.

A program in each district shows the kind and volume of conservation practices needed to reach district objectives of proper land and water use and management. Members of district boards are also obligated under state laws to provide the leadership necessary to get the resources available for conservation work used in such a way as to make maximum annual progress toward these objectives.

The ASC Committees, together with local representatives of the Soil Conservation Service and the Forest Service, have responsibility for planning and carrying out a program of cost-sharing that will, within the limits of available funds, make it possible for those who need cost-sharing assistance to progress toward their individual conservation objectives.

The Agricultural Conservation Program cost-sharing is one of the important ways in which

Note.—The author is assistant to administrator, Agricultural Conservation Program Service, U. S. Department of Agriculture, Washington, D. C.

the public contributes toward conservation of soil and water resources within each district. There is every reason for the ASC Committees and soil conservation district governing bodies to work hand in hand. There is no conflict in their services—each definitely complements the other.

There are additional resources (credit, materials and equipment services, education and technical services, and so on) that are essential in carrying forward individual farm conservation programs. Nearly all of these necessary conservation resources are available in soil conservation districts. Private industry provides others. All persons or groups responsible for any one of these resources need to understand their relationships to each other and their dependence on each other. Maximum progress towards common conservation objectives depends on the extent to which the available resources are correlated.

County ASC Committees and soil conservation district governing bodies are finding many ways to help each other improve their services to farmers. Some mutually helpful cooperative activities that have been observed are listed below:

Things done by ASC County Committees:

1. Request district governing bodies and others having conservation responsibilities to assist them develop a program whereby conservation practices, rates of cost-sharing, and specifications for the county ACP are such as to make a maximum contribution toward solving the soil and water conservation problems of the district.
2. Develop practicable means of giving consideration to the written conservation plan of each farmer or rancher, as a basis for approving cost-sharing for needed conservation.
3. Approve cost-sharing for practices that are necessary and in keeping with the recognized priority for their application.
4. Make every effort to approve cost-sharing for conservation practices that would not otherwise be carried out in adequate amounts and approve such amounts of cost-sharing as to make it economically practical for the farmer or rancher to carry out each practice approved.
5. Assist the governing body of the district and others who control conservation resources to consider ways and means of utilizing each such resource so that maximum conservation work can be accomplished.
6. Arrange for and approve a pooling agree-

ment wherever needed to solve a conservation problem of a community or group of farmers or ranchers.

7. Facilitate carrying out conservation practices by advancing approved cost-sharing assistance to farmers or ranchers in the form of purchase orders that may be used by them in procuring needed conservation materials or services.
8. When needed, transfer funds (not to exceed 5 percent of county allocation) to the Soil Conservation Service to help finance the technical servicing of the county ACP.
9. Make available to the local soil conservation district governing body all information available to the Committee that indicates the kind and extent of conservation problems existing in the county.
10. Assist the local soil conservation district governing body in reviewing and revising the district program as often as needed in keeping with latest research and experience.
11. Assist the educational agencies in developing and carrying out adequate conservation education programs.



Thomas L. Ayers.

12. Give due recognition in any reports, news releases, circular letters, or other public contacts to the services provided through the soil conservation district.
13. Keep the soil conservation district governing body currently informed of any problems of mutual concern and work with them to develop solutions.

Things done by soil conservation district governing bodies:

1. Bring together all available information and experience having to do with the kind and extent of conservation problems and conservation work that needs to be carried out in the district to achieve soil and water conservation on all farms and ranches.
2. Arrange for representatives of all groups having conservation responsibilities to review and, if necessary, revise the conservation program of the district in the light of latest information.
3. Determine, with the assistance of representatives as indicated in item 2, the material, equipment, technical services, and financial assistance required to attain annual conservation objectives mutually agreed on.
4. Encourage and arrange for each agency or person that controls, administers, or sells necessary conservation materials or services to be brought together for consultation as plans are being developed for use of each conservation resource.
5. Develop plans for supplementing the current supply of any conservation material or service that is inadequate.
6. Actively participate in development of the ACP by actions such as: (a) Making available pertinent information from district records; (b) appraising rate of progress and trends; (c) analyzing obstacles to progress; and (d) attending program development meetings and contributing judgment as to relative needs for cost-sharing.
7. Determine from each district cooperator his specific problems, the assistance he needs to carry out his conservation plan, and direct him to sources of help.
8. Get each district cooperator to review his program annually. Show each of them how he can speed up the attainment of his conservation objectives through use of ACP cost-sharing assistance.
9. Develop a public relations program to acquaint all district residents with the interrelationship and interdependence between the resources available to assist in carrying out conservation projects, including the ACP and other programs administered by the ASC Committees.
10. Give due recognition in the district's annual report, news releases, circular letters, and

on tours and field days to the services of the ASC committees and the ACP.

11. Keep the ASC County Committee currently informed of any problems of mutual concern and work with them to develop solutions.

An increased understanding of how the ASC County Committees and soil conservation districts cooperate should result in more conservation work. That each makes a major contribution toward common objectives is evident. Many others who have conservation responsibilities can likewise contribute toward these objectives.

The various forms of conservation assistance made available to farmers through public and private resources are interdependent. For instance, many farmers will not use ACP cost-sharing assistance to install some conservation measures if they cannot get certain types of conservation material or needed technical help in its installation.

The urgency of our national conservation problems requires that all having conservation responsibilities correlate their efforts to supply and make full use of all types of conservation assistance farmers need to solve their problems.

WATERSHED TREATMENT ON FLATLAND

By HORACE P. MORGAN

NEAR Alma, in Bacon County, of southeast Georgia, is the 24,252-acre Mill Branch watershed, in what is commonly called the "flat woods" country. This is an area where the principal native vegetation is longleaf pine. This pinewoods flatland watershed is attractive to passersby and is also notable for another reason. It is 1 of 3 watersheds in Georgia that is being developed by a group of people with practically no outside financial assistance. Government aid to date has consisted largely of help in soil and water conservation practices and other technical assistance by the Soil Conservation Service through the Altamaha Soil Conservation District, and Agricultural Stabiliza-

Note.—The author is area conservationist, Soil Conservation Service, Soperton, Ga.

tion and Conservation Committee assistance on dam construction through pooling agreements.

How did it happen?

None of the landowners was informed on the technical runoff characteristics of their odd topographic watershed where there was no undulating land. The farmers did know, however, that in the spring flooding frequently damaged tobacco beds and row crops adjacent to streams. During the summer months they had been concerned with too little water. Wells went dry necessitating hauling of water from nearby Alma, by a great number of farmers.

M. E. Jones, community leader, farmer, and bank president; J. J. Jones, trade area leader; and Marcus Long, lumberman, electrical engineer, and farmer along with their neighbor-

ing sufferers, had seen enough. The too much, too little water problem had become acute by 1954. This group persuaded R. F. and R. E. Futch, and W. S. Bryant, to build Dam No. 1. The pond gate valve was closed in February 1955, and water stored to irrigate 18 acres of tobacco. These neighbors operating under a water rights agreement produced from 2,500 to 2,800 pounds of tobacco per acre (1,227 pounds, county average), which sold for a premium of 55 to 60 cents per pound.

That did it!

M. E. Jones, who had been instrumental in inducing the original five landowners to build Dam No. 1, liked what he saw and built Dam No. 2 on his own property. It was completed in November 1955. Water from this impounded area will be used to irrigate tobacco, pasture, and corn. Stock watering, fishing, and recreation are the other uses for the ponds.

Further downstream, T. J. Lewis, Jr. and Ralph and Roy Lee completed Dam No. 3 in April 1956. SCS engineers say it should guarantee adequate water to make tobacco crops for all parties.

Immediately adjacent to Mill Branch watershed, Alvin Whitley did such a good job with still another dam constructed in 1956, that on the basis of it and other soil and water conservation practices, the Altamaha Board of Supervisors nominated Whitley for the Good-year Award from that five-county district.

Dams 4 and 5, will be built further down the watershed in the fall of 1956 by Alton Less and C. J. Hamilton. When some difficulties in connection with land clearing and construction are solved, R. L. Floyd, Taft Johnson, and Hilton Sweat hope to begin on Dam No. 6.

When built, the dams will substantially reduce recurring water problems.

Work Unit Conservationist of SCS, Robert H. Martin, observes that, "The dams are an integral part of an overall soil and water conservation program that embraces other practices. Seeding of perennials for hay, seed, and pasture; tree planting, woodland protection, wildlife area improvement (mainly lespedeza bicolor plantings), and water management on cropland in the watershed are being applied according to the Altamaha Soil Conservation District basic plans."



Laying asphalt coated drain pipe (above); pouring concrete to anchor supports for riser pipe (below) on dam No. 3, Mill Branch watershed.



Irrigation Water Management Pays

By R. L. STRONG

THE success of L. G. (Grant) Zartman, of Albuquerque, N. Mex., proves that proper management of irrigation water is one of the more important, if not the most important, conservation practice on irrigated farms.

Grant Zartman operates an 85-acre dairy farm 6 miles south of Albuquerque. His farm was chosen by the Soil Conservation Service for a demonstration of conservation practices in 1942. He became one of the first cooperators with the Tijeras Soil Conservation District when it was organized in 1945. He attributes much of his success to proper irrigation water management and other conservation practices that he has applied on his farm. His theory is that successful farming and conservation go together.

A native of Indiana, Grant came to New Mexico in 1934 and bought his present 85-acre farm. When purchased, much of the land of the farm was in trees, brush, and river dunes. Irrigation water was applied in a haphazard manner, the water being allowed to take the course of least resistance, with no regard to soil types or field layout for efficient operation.

Grant started reorganizing the farm at once and when the Soil Conservation Service offered

technical assistance to farmers who would co-operate, he asked for that assistance.

Gradually, the land was cleared and the fields leveled for more efficient use of irrigation water. He learned to make his own engineering surveys for land leveling and irrigation system layouts. Though Soil Conservation Service engineers are available to help him, he prefers to do most of his own engineering. He believes that by so doing, he has a better understanding of what is to be done, thus getting a better job.

The first step towards proper application of water was to level the land already in cultivation. To accomplish this, at a cost within reason, some fields were leveled on a contour, some were benched, others were made flat. At the time the fields were leveled the ditches were laid out and built. Concrete turnouts, drops, and checks were installed to facilitate the handling of water.

Zartman began to study the water application on his fields and found that some fields were not responding as they should. When the Soil Conservation Service and Extension Service wanted to conduct irrigation trials and soil judging contests, he offered his fields for this purpose. Through these trials he realized that various soils took water differently. Grant then asked the SCS to make a detailed soil survey

Note.—The author is soil conservationist, Soil Conservation Service, Albuquerque, N. Mex.



Dairy cattle on an irrigated pasture of the Zartman farm.

of his place. After this was done he leveled some fields, and even changed the direction of the irrigation runs on others to conform to soil types, so as to get proper application of the water.

He now knows about how much water to apply and how often to irrigate each field.

Never letting a year go by without taking advantage of the Government's Agricultural Stabilization and Conservation program of assisting farmers to install conservation practices, he first leveled his land then installed the turnouts, checks, and drops. About 4 years ago he started lining with concrete about 1,000 to 1,500 feet of ditch annually. He has lined 5,450 feet of ditch and plans to complete the job by lining 1,000 feet in the spring of 1957. In addition, he has installed underground 1,280 feet of 24-inch concrete pipe. When he finishes the lining next spring, his water distribution system will be as nearly perfect as it is economically feasible to have it.

Zartman uses his land to produce feed for his herd of high producing Guernseys. He is a firm believer in irrigated pastures. The other land is in winter grains for winter pasture and corn-sorgo mixture for silage. The pastures are a mixture of orchardgrass, ladino clover, and alfalfa. During the growing season these pastures will support 3 to 4 cows per acre. Any pasture that gets ahead of the cattle is cut for hay. In cooperation with the New Mexico Extension Service and Soil Conservation Service he is running a variety test on orchardgrass. One of these strains, developed at the Soil Conservation Service nursery near Bernalillo, N.



Grant Zartman poses by a section of concrete lined irrigation ditch.

Mex., gives great promise for high production.

Using a corn-sorgo mixture his production of silage varies from 20 to 25 tons per acre. This is stored in a trench silo and fed during the winter months.

Zartman fertilizes heavily. He says that every dollar spent for fertilizers brings him 3 to 5 dollars worth of crops. He also uses large amounts of sawdust and wood shavings for bedding. This gives him sufficient manure to make a heavy application to each acre on the farm annually.

His farming operations produce summer pasture and winter silage for his Guernsey herd of 80 cows and 50 heifers. With one-third of the herd young cows, the butter fat production averaged 401 pounds per cow in 1955. His milk is sold at a premium as certified Golden Guernsey milk.

He buys most of his hay and concentrates. He does not feed concentrates heavily, believing that high quality roughage produces milk cheaper than grain feeds.

No story of Zartman's water and soil conservation accomplishments would be complete without recording his achievements in competition with other farmers in the State.

His irrigated pastures were on the Bernalillo County team of three pastures that won the award given by the National Plant Food Association in the New Mexico Farm Grasslands



Experimental pasture of orchardgrass, alfalfa, and clover owned by Grant Zartman (left) with Jose Maria Pire of Spain and R. L. Strong of SCS.

program for 1952, and again in 1955. Mr. Zartman's pastures were not eligible for the competition in 1953 and 1954. Bernalillo County won the contest in 1953 without any of the first three pastures entering the competition.

In 1954, Grant won the Woodmen of The World farmer contest for New Mexico, Zone I, comprised of 16 soil conservation districts, in northwestern New Mexico.

In 1955, he won the J. D. Coggins award as best conservation farmer in New Mexico.

Zartman is a director of the Middle Rio Grande Conservancy District, and has served as community and county committeeman for the Production and Marketing Administration, county committeeman for the Farmers Home Administration, and as a 4-H club leader.

Learning While Earning

The student trainee program of SCS has helped recruit many valuable employees, who, in turn, have rendered valuable service to SCS.

By E. J. PETERSON

BILL CLAYTON of the Soil Conservation Service Work Unit office in Harrisburg, Pa., is a man with a purpose and therefore a man to watch. He just graduated from the college of Agriculture at Pennsylvania State University in January 1956. He majored in agricultural education. While Bill is a very recent graduate of college, he is somewhat an "old hand," so to speak, in the Soil Conservation Service. He is a product of the student trainee program that the SCS has had in operation since 1948. Because his story is so typical of hundreds of student trainees which the SCS has employed we'll let Bill write his story just as he told it to me.

"Mr. McClelland was my vocational agriculture teacher in my sophomore year at Trinity High School in Washington, Pa. He and



Bill Clayton (left) discussing the conservation plan for the Cleveland Brothers farm with Dick Hatcher, farm manager.

Frances Bownes of the Soil Conservation Service were working together to develop interest in soil conservation projects as part of our schoolwork. My enthusiasm for this project induced Dad to become a cooperator with the Washington County Soil Conservation District. Jim, my brother, and I worked together to help Dad get a soil conservation program on our farm.

"In 1950, I decided to go to college and at that time I was fully intending to prepare myself for a teaching career in some phase of agriculture. In the spring of 1953, I noticed a Civil Service announcement for an examination for student trainees in soil conservation. I was particularly interested because it offered me an opportunity to work during the summer and earn some money. This was important since I was married and had to support a family as well as go to school. More than that, it gave me a chance to get an inside look at what a professional conservationist did on his job. I passed the exam, I got a job, and was assigned in my home county.

"Bill Fennell, our work unit conservationist in the district, really 'put me through the paces'—not only that summer but the next two summers as well. During my three summers with the Soil Conservation Service I was trained in

Note.—The author is chief, safety and training branch, Soil Conservation Service, Washington, D. C.

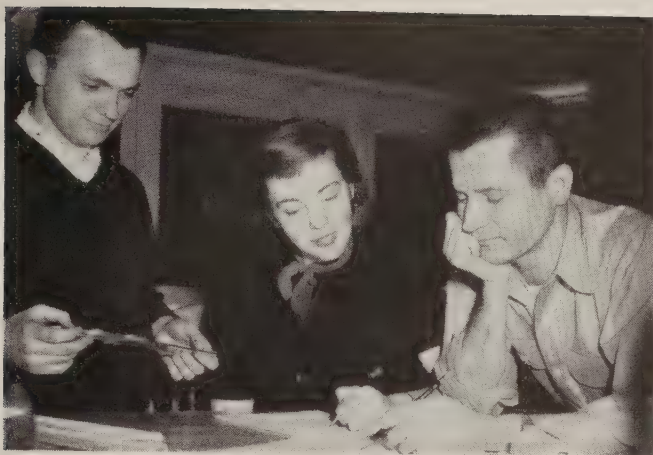
laying out soil conservation practices such as diversion terraces, tile and open ditch drainage, stripcropping, terracing, and other practices. I worked with the soil surveyor to make conservation survey maps. During the summer of 1955, I had an opportunity to help do some farm planning, working closely with the work unit conservationist. Of course, all the way through these experiences I was learning about the policies and procedures of the Service and its basic philosophy and objectives. Also, I learned to know a lot of people in the Service. What's more I liked them, and what they believed, and how they are dedicated to their work. Now I'm going through a process of further training and looking forward to a long and successful career in the Soil Conservation Service.

"Since you asked me what I thought of the student trainee idea, let me give you my feelings. If it hadn't been for this program, I might never have worked for the Soil Conservation Service because that wasn't what I had in mind when I started to college. After my first summer's work, I got a little more practical slant on the courses I ought to take to qualify for SCS work. For example, I took courses in geology, agronomy, physical geography, and soil conservation that were not in my scheduled course. What's more, I got a very realistic view of what a soil conservationist did in the field—and I like it—like it so well in fact that I've decided on it as a career.

"I know too that you will appreciate this point during these days when it is hard to recruit the people you need. I can honestly say



Judith Merrick inspects a SCS recruiting poster.



These students of Drexel Institute of Technology (Philadelphia) learn about soil conservation while employed by SCS at the Upper Darby, Pa. office, (left to right) Ray Cline, Judith Merrick, and Stanley Witynski.

that there are about a dozen people from Penn State University who are now working for SCS whom I steered to your personnel office. When I came back after a summer's work I'd tell the men about my experience and they would apply and get appointed. The idea of earning while learning during the college years is a good deal for most college students. On the basis of my experience I'd highly recommend it to any college student."

Frederick B. Walter, a civil engineering student from Montana State College at Bozeman is another employee who came to SCS as a student trainee. He has this to say. "Now, after two summers in a work unit office, I can say that I am familiar with nearly every phase of the SCS as well as the soil conservation district programs. The most important part of my training has been the overall impression I got of the types of work involved and the personal satisfaction the work has given me. Though most of my field training has been in engineering, I have also been introduced to such activities as soil surveying, farm planning, and range management. Soon my trainee period will be over. If I decide on a job with SCS, it will be because I know the job and like it."

Adger B. Carroll, a Clemson College student who was with SCS during the summer of 1955 had this to say about his experience. "My work this summer has meant more to me than just a job to pass the summer. It has been work that impressed me with not only the value of local leadership through district supervisors, but gave me an idea of the wonderful oppor-

tunity for farmers in obtaining assistance in conserving the fertile soil that is so vital to the American people. Tremendous amounts of valuable soil can be saved for there are great possibilities for making productive again the wasted or mistreated land which is not being managed according to its capabilities."

The Service's experience with the student trainee program has been a very successful venture in the field of recruiting and training career employees. Since 1948 the SCS has employed more than 1,000 student trainees throughout the Nation, many of whom are now with the Service as permanent employees.

We are hoping to expand and encourage this program further as part of a long range personnel program so that we can get career employees while they are still in college. We can provide intensive training on the job and counsel with the trainees on their courses of study when they return to college each fall.

A PROFITABLE TREE CROP.—In 1940, "Arl" Hildebrand of Prescott, Ark. was tempted to have his 8 acres of pine timber clear cut. At that time he had 3,000 board-feet per acre of 9" stagnated trees and the \$300 it would bring was very tempting. Instead, he was persuaded by SCS technicians to selectively cut the 8-acre stand. He is not sorry that he did. The stand was marked and cut in 1940, 1945, and 1950. In the 10-year period Hildebrand harvested \$100 off each acre and has added \$120 per acre to capital stock (the increase in growth his trees have made since he started improving his woodland).

In 1955, Hildebrand marked, cut, and hauled his logs to the mill. He netted \$850 from the 8 acres, a profit of nearly \$110 per acre in the last 5-year period, or \$22 per acre per year. The best part is that he has more timber now and it is in better shape than when he started in 1940. Each acre is now worth more than \$300.

FROM COTTON TO PINE.—Jane Ross, daughter of the late Hugh Ross of Arkadelphia, Ark., reports that her father planted to shortleaf pine a 30-acre wornout and abandoned cottonfield. Ten years later the stand was thinned and produced 12 cords of pulpwood per acre. Four years later the stand was thinned again and yielded 8 cords of pulpwood per acre. This means that during the 14 years after it was planted, the woods yielded 20 cords of pulpwood per acre that brought in a total a total of \$73 per acre, or \$5.22 per acre per year for the 14 years.



ANCIENT LOBLOLLY.—Rings on this section of a Louisiana loblolly pine shows it started growth as a seedling in 1803, the year of the Louisiana Purchase. Linton Jones, SCS technician in Jackson Parish, La., indicates the point where growth began. The white strips above indicate growth points at other historic events during the life of the tree. These include: War of 1812; first steam locomotive, 1830; Mexican War, 1846; California Gold Rush, 1849; War Between the States, 1861; invention of electric light, 1879; Spanish American War, 1898; World War I, 1917; Pearl Harbor, 1941. The 145-year-old tree was cut in September 1948 by George Toms. The merchantable length was 56 feet, and contained 3,016 board feet of timber. Diameter at breast height was 48 inches. The lumber sold for \$99.52.



SEPTEMBER 1956

Soil Conservation

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION.

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SECRETARY OF AGRICULTURE

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ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

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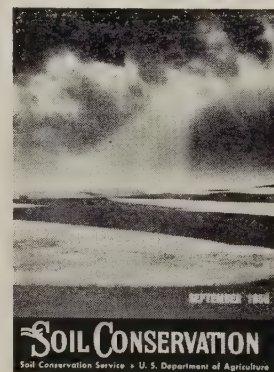


SOIL STEWARDSHIP.—More than a million Georgians participated in Soil Stewardship Week May 6-13, 1956. And this does not include newspaper readers, radio listeners, or television audiences.

Soil Stewardship Week was jointly sponsored by the State Soil Conservation Committee and the State Association of Soil Conservation District Supervisors. It was the outgrowth of Soil Stewardship Sunday and Soil Conservation Week combined into a single week of soil and water conservation activities.

Outstanding accomplishments during Soil Stewardship Week resulted from the cooperative effort of all the agricultural agencies working together to get people interested in soil and water conservation. Also participating in the event were civic clubs, ministers, newspapers, radio and TV stations, schools, farmers and other individuals.

A summary of activities includes: 24 special editions of newspapers with 793 articles, 88 editorials, 358 pictures, and 304 advertisements; 264 radio programs; 347 radio flashes; 13 TV programs; 42 TV flashes; 981 sermons; 57 tours; 56 demonstrations; 206 general meetings; 117 civic club programs; 262 motion picture shows; 33 exhibits and displays.



FRONT COVER.—The sun peeps through a break in the clouds above an Idaho farm.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Greater Profits From Greater Care

By DAVID N. SUDDUTH

EFFICIENT use of land, rather than exploitation, is the objective of Malcolm S. Anderson, who owns a 193-acre irrigated farm 5 miles northeast of Lucerne, Colo.

Anderson acquired this farm in 1950. Even though it had a past record of high production, he soon recognized the need for further improvements. Shortly after taking over the farm he applied to the board of supervisors of the West Greeley Soil Conservation District to have his land included in the district. This enabled him to request technical assistance from the Soil Conservation Service.

The first step in the conservation program was preparation of a detailed soils survey of the farm. The soils survey formed the basis on which Anderson and SCS technicians then developed a plan of conservation.

First attention was given to improving the field grades by leveling operations. After the

first leveling job was completed, Anderson noted that he had accomplished eight objectives with that first job.

"I was able to eliminate point rows and a seepy dike, and also to equalize the length of irrigation runs and the size of my fields," he stated. "At the same time I could shorten the length of irrigation runs, which saved water. I ran my rows across the slope rather than downhill. This checked erosion between the rows.

"Besides," he added, "this job enabled me to redistribute and reuse my water. A beneficial change to about 100 acres of cropland was brought about by tying the field into existing grades."

There is little doubt in Anderson's mind that a good quality job of leveling pays off in more ways than one. He has plans to do more in the future. Erosion of head ditches on sandy soils, seepage loss of valuable irrigation water, and a high water table in some of the cropland

Note.—The author is work unit conservationist, Soil Conservation Service, Greeley, Colo.



Malcolm S. Anderson and part of his herd of feeder cattle.



Concrete lined irrigation ditch on the Anderson farm.

were other problems that Anderson faced.

He approached these problems with a combination of practices. To date he has concrete-lined about 5,000 feet of main head ditch. Drops were installed in ditches on the steeper slopes to step the water down the slope in level sections from which he can take water to irrigate row crops. This solved the erosion problem on his head ditches. Water losses through sandy soils, which had been feeding a seep-spot below the ditch at one point on the farm, also were eliminated.

"I think," said Anderson, "that one of the most important benefits has been the labor I've saved in irrigating my crops from lined ditches."

Anderson also joined with his neighbors in lining about 1,200 feet of supply ditch crossing a leaky dike. This resulted in saving considerable water for delivery to the farm.

Individual field drainage was the next problem to be worked out. He called on soils and engineering technicians of the SCS to help him.

They surveyed ground elevations and made test borings to a depth of 9 feet over the entire area affected by subsurface seepage. This investigation enabled technicians to obtain information on the movement of underground water, the direction it was flowing, and the depth to the impervious material that was preventing downward movement of water thus causing the seep spots.

This information was used to design a tile drain system on the impervious underground layer where it intercepts the underground water as it moves into the affected area. The water is led off on grade to a point of disposal. In

1954, Anderson installed drains totalling about 1,960 feet of tile which resulted in reclaiming approximately 24 acres of cropland. The followup treatment is equally important in reclaiming drained land. The area will be planted to salt tolerant crops that require heavy applications of water in order that soluble salts in the soil can be diluted and leached down and out of the root zone of the crop.

Anderson believes in a balanced program of conservation farming with the commonly known vegetative practices receiving just as much attention as the structural practices.

"Since my leveling and drainage work, I am now able to use a good rotation," he says. His rotation, which he refuses to disturb, consists of 3 fields in alfalfa for 3 years of production, 2 fields in corn, 2 fields in beets, 1 of small grain, and a new seeding of alfalfa. One field of alfalfa is plowed out each year.

"My feeding program balances out my setup" he says, although he admits that sometimes he has his fingers crossed when he takes a look at the cattle market. Anderson feeds about 22 carloads of cattle a year. This is the manufacturing plant for the valuable manure that goes out to the cropland to build up organic matter and soil structure.

"The program works hand in glove," says Anderson. "I figure that if I can feed 1 animal per acre of irrigated land on a year-round basis in a well-bedded feed lot, I will get around 30 tons of manure for each acre of beet ground annually." He supplements this with commercial fertilizers.

"We're experimenting with spreading man-



Laying 6-inch tile drain on the Anderson farm.

ure and fall plowing these sandy soils," he commented. When the wind erosion hazard of fall plowing sandy soils was pointed out to him, he agreed and added, "This is strictly an experiment and if it doesn't work we will go back to spring plowing."

Anderson summed up with the statement: "Conservation farming is a two-way proposition. You take greater profits from the soil but you have to give the soil greater care to do it."

Colorado Districts on Educational TV

By HERBERT I. JONES

COLORADO'S Upper Platte Association of Soil Conservation Districts has been accepted as the 20th member of the governing council of KRMA-TV Denver. The station devotes all its programs to educational television. The Platte Valley group will represent the state association of districts. George Weaver, cattle rancher and district supervisor of the Fort Collins SCD, has been named temporary head of the educational effort. Weaver will attend monthly management meetings of the council and will help lead the fund drive.

The TV Council, made up of educational and cultural agencies, numbers among its members: Colorado University, Colorado A & M, Denver University, the Denver Bar Association, the American Institute of Architects, the American Institute of Banking, and the Petroleum Industry Institute. The entire operation of the station is in the hands of the council. Membership requires, in addition to substantial financial support, a record of public service to the area, and a willingness to supply program material.

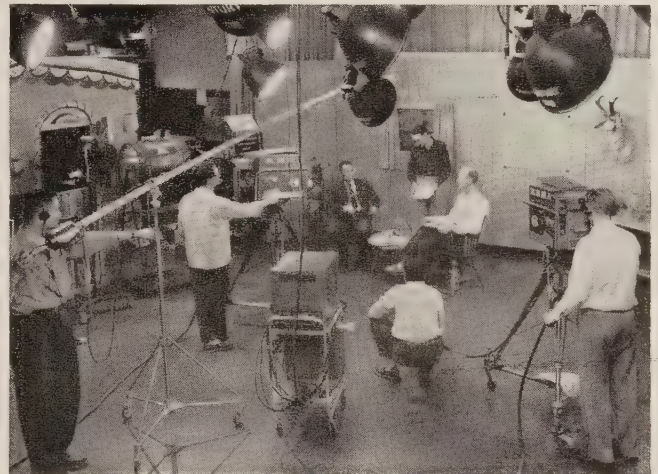
The council's budget for 1956 calls for an expenditure of \$125,000 for operations alone. Program participants pay their own production costs. KRMA facilities were built and paid for by the Denver Public Schools.

Currently, air time is 2 hours each weekday

night from 7 to 9 p.m. About 360,000 TV sets are within reach of KRMA's signal. Many of these are in the rich irrigated farm section of the South Platte Valley. Farmers and ranchers in at least 25 districts can view the educational programs. Estimates indicate that about 87 percent of farm families in this area have TV sets.

Council plans call for stepping up power as progress dictates. A new building to house studies and equipment will soon replace the temporary quarters located in Denver's world famous Opportunity School.

On the air since February 1, outstanding programs have been "Redman's America," a series on Indian culture; conversational Spanish lessons; hunting and fishing news; garden hints; and special children's programs. About 60 percent of the programs are live.



Rehearsal of an educational program in the studios of KRMA-TV

District representatives view membership on the council and the privilege of using KRMA facilities as an outstanding opportunity to present conservation facts. Their enthusiasm is shared by other council members who welcomed the Upper Platte group. John Eastlick, Public Library director, and council president, commenting on the district's membership said, "The application of sound soil and water conservation methods is important to every farmer, to every American. We want to help spread information about these methods and aid in their adoption by Colorado citizens."

Note:—The author is soil conservationist, Soil Conservation Service, Littleton, Colo.

Sweetclover, Sheep, and Wheat

By CHARLES T. WEBB, JR.,
VERN NELSON, and DAVE HICKMAN

FOR the last 5 years Washington farmers, in the vicinity of Palouse and Pullman, have been "eating their cake and keeping it too." They have done this by pasturing sheep on second-year sweetclover, then plowing under the residue. In most cases the sheep are transit flocks from other areas. When an animal eats the high-nitrogenous material it uses only 20 percent of the nitrogen to make up the protein of its body and returns the other 80 percent to the soil.

A good sweetclover seeding will return a lot of nitrogen to the soil. In the Palouse area when sweetclover is turned under green, in early summer, heavy erosion usually results the following winter. When using the sweetclover for production of lamb chops plowing is delayed until the ground is dry. A cloddy condition from plowing then will materially reduce erosion during the winter.

The soil in this area is a deep silt loam with a moderately tight subsoil. Most of the yearly rainfall, an average of 21 inches, comes in the

late fall when winter wheatfields are vulnerable to erosion. This is especially true where summer fallow or early-plowed sweetclover has preceded the wheat. The soil, which averages about 6 feet in depth, will hold about 18 inches of moisture. With the average annual rainfall, there is more water than can be accommodated in the soil column unless a crop is grown each year. Where this is not done water is lost by percolation or by surface runoff. In the hilly topography of the Palouse surface runoff causing severe erosion is an ever-present threat.

Over a 3-year period (1952-1954) a comparison was made on fields where sweetclover was plowed under as a green manure crop, the usual practice, and fields where sheep were pastured till late summer or fall and then plowed. The yield of winter wheat was close in each case as shown below:

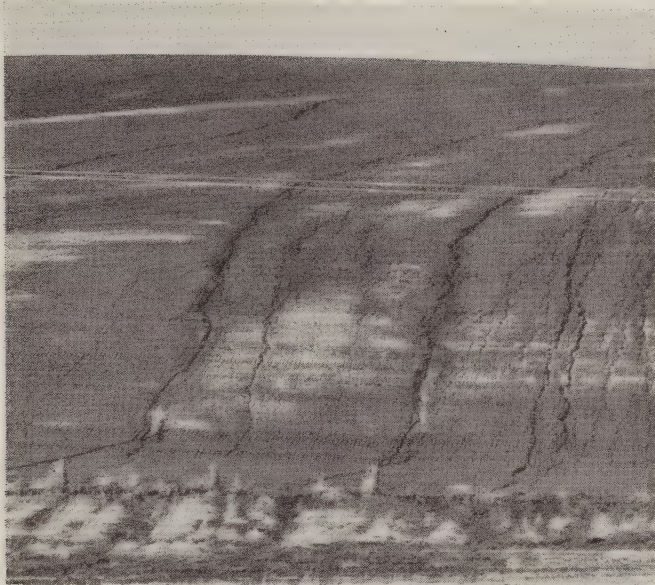
	<i>Number of fields</i>	<i>Bushels of wheat per acre</i>
Sheeped-off sweetclover	30	54.4
Green manure sweetclover	26	52.0

The greatest increase in the crop yield, after sheeping sweetclover, came on the clay ridges

Note.—The authors, all with the Soil Conservation Service are, respectively, work unit conservationist and conservationist of Pullman, Wash., and conservation aid of Palouse, Wash.



Sheeping-off sweetclover on Palouse hillside.



Erosion caused by winter and spring rains on Palouse wheatfield that was clean fallowed the previous summer and fall.

where it is natural for sheep to bed down during the night. With increase of manure on the ridges, where fertility was low, a highly beneficial effect was obtained.

Comparing the effect on erosion of green-manured fields and sheeped-sweetclover fields, data were obtained from 182 fields totaling 15,210 acres in the North and South Palouse Soil Conservation Districts. Data from fields plowed early or late, were kept separate. In the table below the green manured fields plowed after July 1 were considered late, but the late pastured fields were not plowed until after August 15.

Fields in sweetclover	Number	Acres	Soil loss, tons per acre
Early plowed, not pastured	66	5,280	13.9
Late plowed, not pastured	80	6,320	6.8
Late plowed, pastured	36	2,610	3.3

The date of plowing was the big factor in reducing erosion. Because of this reduction SCS technicians are interested in the practice of pasturing sweetclover. When sweetclover is plowed early, in the Palouse area, the field generally must be worked several times for weed control. This "fining" of the soil is largely responsible for the heavy soil loss. On the

other hand, where sweetclover is pastured and plowed late, the ground is dry and works up rough. It is in good shape to take the fall and winter rains. In addition to reducing erosion, late plowed fields eliminate the cost of weed control.

"I plan to pasture my sweetclover from now on," says Raymond Harlow, who farms 3 miles west of Pullman. "In the past I have had severe erosion on early-plowed sweetclover, but for the last 3 years I have received cash rent and have kept the soil on the hills by pasturing and plowing late." He added, "It's kinda rough on the drills, but it sure pays in erosion control."

The same results can be expected where the operator pastures the clover with his own herd of cattle or sheep. However, in many cases, the number of cattle or sheep owned by the farmer is not large enough to fully utilize the available pasture. The important reason for reporting only on itinerant bands is that records are kept. The records are necessary for the sheepman to settle with the farmer for the pasture used.

The sheepmen have had difficulty with bloat. To date, however, their loss is less in pasturing sweetclover than on open range in the mountains. After becoming accustomed to the sweetclover, the sheep will make more rapid gains on sweetclover than on the range.

George Hislop of Spokane, Wash., pastures several bands of sheep in the Palouse. Accord-



Palouse wheatfield on which sweetclover was pastured during previous summer and plowed rough in the fall shows little signs of erosion.

ing to him an average stand of sweetclover will return \$5 per acre to the farmer when he receives 1 cent per head per day, the usual charge. "It takes an exceptionally good stand and growing season to return \$10 per acre," Hislop says. "We did pasture 110 acres with approximately 1,300 head for 3 months, which I believe figures out about \$10 per acre," he comments.

By reducing erosion fourfold, maintaining good yields and receiving a small cash return, some Palouse farmers are "eating their cake and keeping it too."

Earth Moving for Soil and Water Conservation

By JAMES L. AULL

SOIL Conservation District cooperators in South Carolina are big operators when it comes to earth moving. As a combined group, they rank among the biggest in the State.

Soil and water conservation practices that involve the most movement of dirt are ponds, drainage, and terracing. A breakdown of these practices on which Soil Conservation Service technicians gave help during 1955 shows the following: ponds constructed, 3,266; drainage constructed, 298 miles; terraces constructed, 1,958 miles. Each of these practices is mainly a soil moving operation.

An analysis of the scope of these activities reveals some interesting statistics in connection with moving soil. Construction of ponds involved the moving of 11,006,458 cubic yards; construction of drainage ditches involved 1,292,931 cubic yards; and construction of terraces involved 2,584,560 cubic yards. These jobs were accomplished during the 1955 calendar year in South Carolina. Add them all up and you have the staggering total of 14,883,949 cubic yards of soil moved.

This much soil would build a dam 30 feet high and 23 miles long with an 18 foot roadway on top. Looking at it another way, this amount



Earth moving equipment starting construction of a farm pond.

of soil would fill enough standard 41-foot freight gondolas to make up a continuous train that would take 18 hours, traveling at 60 miles an hour, to pass a given point.

This big earth moving operation didn't just happen by itself. In addition to technical help from the SCS, and cost-sharing assistance from the ACP, contractors and equipment dealers played a major part. Two hundred and ninety-six contractors contributed the use of 175 draglines, 315 crawler tractors including bulldozers, and 115 scrapers. In addition, innumerable farm tractors were used on terrace construction.



Dragline digging a drainage ditch.

Note.—The author is state engineer, Soil Conservation Service, Columbia, S. C.

A Second Look At Brighton

Kudzu, tall fescue, and sericea help protect the water supply of a rapidly growing urban area.

By C. S. BRITT and C. S. SLATER

THE growing water needs of suburbs built along the Maryland borders of the District of Columbia made Brighton Dam a necessity. Back of it the waters of the Patuxent River form Triadelphia Lake, a major storage basin of the Washington Suburban Sanitary Commission. Now a second dam has been built below the Brighton to meet an ever-expanding need for water. Needless to say the storage basins back of these dams are being protected by erosion controls against loss of capacity by the deposition of sediments.

Brighton Dam, immediately after its construction in 1943, posed some special problems

in erosion control. A highway runs across the dam. Grading of the approaches left huge cuts and raw fills devoid of vegetation. After heavy rains, water flowed swiftly along roadside gutters picking up earth and gravel and transporting it to the lake below. This was a problem where knowledge gained in its solution could be applied to roadside erosion throughout the watershed and, as we now know, to the second dam downstream.

The main problem was erosion control with vegetation. Three kinds of plants proved to be of outstanding value. They were tall fescue (Kentucky 31), lespedeza sericea, and kudzu.

Difficulties had to be met on each site where a trial planting was made. Rabbits denuded fresh-set kudzu crowns as fast as they grew

Note.—The authors are soil conservationists, soil and water conservation research branch, Agricultural Research Service, Beltsville, Md.



Air view of Brighton Dam and Triadelphia Lake.



Kudzu was used on many of the steeper and long slopes in the Brighton watershed.

until they were protected by squares of wire netting placed over the succulent growth. Once established the kudzu outgrew the rabbits. Some of the other difficulties encountered in the watershed are illustrated in the following excerpts from field notes:

Site 1: Roadbanks on either side need shaping before applying manure, fertilizer, and sericea hay for seed and mulch. Site 11: Fill in beside cattle culvert and divert water to pasture above cattle crossing. Contact the farm owner about diverting water to pasture. Site 17: Steep banks on either side will need stakes to keep mulch from sliding when planted to lespedeza. Site 18: Deep gullies must be filled and water diverted. Shoulder of fill should be paved. Site 31: Plant to kudzu. Dig holes to set the crowns and place fertilizer in slot about 6 inches away from kudzu. Site 47: These banks are stabilizing with honeysuckle. Let honeysuckle take over. Apply fertilizer. Site 60D: Poorly drained. Remove boulders, smooth, fertilize, and fall plant to Kentucky 31 fescue. Use mulch.

The intent of these excerpts is to recall our first look at Brighton when heavy rains moved tons of soil down roadside gutters to the lake below. A second look today reveals a pleasing landscape where erosion is controlled—the soil stabilized under a protective mantle of living vegetation—a permanent supply of clear, cool water.

Because fertility was so low on the exposed subsoils, heavy applications of fertilizer were used to promote thrifty growth of vegetation. Periodic maintenance and fertilization will be necessary to insure continued vigorous growth and effective erosion control.

Ideas and help from many sources made the conservation plan that protects Brighton Dam and the Triadelphia Lake watershed. The Washington Suburban Sanitary Commission, University of Maryland, Soil Conservation Service, Howard County Commissioners, Montgomery County Council, and Howard and Montgomery Soil Conservation Districts all contributed to the program.



Tall fescue stabilized this eroding bank. A straw mulch (above) was used at planting time.

A DISTRICT BILLBOARD

By HAROLD A. LIVERS

WHEN Antelope County, Nebr., farmers approach Neligh from the southeast on Highway 275, they are greeted by a big new sign erected last fall on property of the Antelope Soil Conservation District.

On the sign 9½-inch red enameled letters that can be put up and taken down like letters on a theatre marquee spell out timely soil conservation messages and slogans.

The 6 by 14-foot sign is trimmed in green and white with a green enameled background for the district's name.

Slots in the 2-inch cross pieces allow the letters to be shoved up and then dropped down. The letters are made of pressed hardboard.

The area around the sign was recently land-

scaped with silver junipers at the ends and Pfitzer junipers across the front. The area behind the sign was planted to Austrian pines.

During the winter months Supervisor Merwin Olson placed three sign lights across the top. A time clock regulates the lighted sign during the evening hours.

Supervisors trimmed the sign during the Christmas season with cedar boughs and colored lights and the message, "MERRY CHRISTMAS AND A HAPPY NEW YEAR."

The sign was constructed locally with the material, painting, letters, and erection costing about \$225.

The \$100 award from the *Omaha World-Herald* based on local activity of the board of supervisors last year was used to pay costs of wiring.

Note: The author is Work Unit Conservationist, Soil Conservation Service, Neligh, Nebr.



District supervisors (left to right): James C. Snodgrass, C. V. Taylor, and F. F. Reinke watch SCS conservationist where pan was not shattered, suffered severe drought damage.

Break Up The Traffic Pans

No. 17

This is the seventeenth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By W. A. RANEY

SOME soils have layers that interfere with the movement of water and air and limit the penetration of plant roots. These layers are called pans. Two types of pans are encountered. Horizons such as clay pans or silt pans that are formed in the subsoil by the natural processes of soil development represent one type. The other is represented by soil layers that are compacted by excessive or improper tillage, or by implement or animal traffic.

Note.—The author is soil scientist, soil and water conservation research branch, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Md.

This second type is frequently called a traffic pan. It is becoming more and more common as heavier tractors and farm implements are being used more frequently.

There is some evidence to indicate a normal downward movement of clay to the top of a traffic pan. Under these conditions the problem will likely become more serious from natural processes unless something is done to overcome the traffic pan.

Traffic pans are most common in medium textured soils—loam, sandy loam, and silt loam. These soils, which are generally devoted to row crops, are subjected to a greater amount of traffic than nonrow crop soils. If a traffic pan is present, it is found just below the zone disturbed by normal tillage practices and is similar in texture and chemical properties to material immediately above and below it.

By reducing the rate of downward movement of water, traffic pans reduce the amount of water that is stored in the soil during periods of surplus rainfall. Pans also markedly reduce irrigation efficiency in the arid region. Since



Drought injury was slight to soybeans in foreground, where traffic pan was shattered; beans in background, where pan was not shattered, suffered severe drought damage.

root growth into dry soil is negligible, any reduction in water storage may effectively reduce rooting depth.

Poor aeration in the traffic pan may also limit root penetration. Cotton roots have been known to penetrate traffic pans when there was moderate soil moisture and adequate aeration, but failed to do so when soil moisture content approached field capacity and aeration was inadequate. This condition of poor aeration during the period of most rapid plant growth causes plants to be shallow rooted and renders unavailable any moisture that is stored in the subsoil.

The poor internal drainage associated with traffic pans frequently causes severe soil erosion, poor seedling survival, and by delaying cultivation may also result in appreciable weed problems.



Roots of a cotton plant that are unable to penetrate a traffic pan.

Improper use of farm machinery and tillage of wet soils are probably the major causes of traffic pan formation.

Soil moisture acts somewhat like a lubricant that reduces the frictional resistance between soil particles, and increases the amount of compaction from a given amount of implement traffic. There is a decrease in the ability of soil aggregates to withstand implement traffic, without being destroyed, as moisture content increases from an air dried condition. These relationships explain why the subsoil, which usually has a higher moisture content than the surface soil, may be compacted by implement



A chisel partially shatters a traffic pan.

traffic when surface soil has a moisture content that is optimum for operation of most tillage implements. These relationships between soil moisture content and subsoil compaction emphasize the need for minimizing tillage operations when soil moisture is optimum for compaction.

Insofar as possible, operations requiring traffic should be completed when the soil is relatively dry. Soil bearing strength is greatest and compaction susceptibility least at the end of the cropping season when soil moisture is depleted.

A combination of tillage and crop management are necessary to overcome traffic pans. Tillage operations alone may shatter a pan but the effects are usually temporary because the stability of soil structure of the pan is low. Stabilizing soil structure in the pan requires root development in the pan where root development is restricted unless the pan is shattered by tillage implements.

Traffic pans must be shattered when the soil is relatively dry, and the tillage operation must give a continuous shatter to the pan for maximum effect. When the pan is wet, it will not be shattered and the compaction problem may be accentuated.

When the soil is very dry, more power will be required to pull a shattering tool through the soil than when the soil is slightly moist but the shatter effects will extend a greater distance on either side of the implement and lateral

spacing of the shattering tools may be increased.

The depth to which shattering tools must be run should be determined by the depth to and thickness of the pan. For effective shatter tillage must extend below the pan.

There must be sufficient rainfall or irrigation following the shatter to replenish subsoil moisture reserves before best results can be expected. Even then, there may be little gains in crop yields above those obtained on non-shattered areas if rains are frequent enough to prevent moisture deficiencies in the surface soil. It is not economical under arid conditions to add irrigation water frequently enough to prevent soil moisture deficiencies on traffic pan soils

where roots are restricted to the surface few inches of soil.

If a pan is shattered for two or three successive years, there are indications that cotton, corn, and soybean roots will impart enough durability to the shattered pan to reduce the need for further shattering operations for a while.

The marked response to tillage in overcoming traffic pans has led to indiscriminate use of such treatments on soils with no pan. There is little likelihood of either soil or plant response to such tillage where there is no pan, or where soil is composed of montmorillonitic type clay that shrinks sufficiently on drying to crack open and shatter a pan naturally.

Sixth Graders Learn About Conservation

By BARRINGTON KING

IT started out as a poster contest but soon became a full-fledged conservation unit in 34 sixth grade classes in Wake County, N. C. And as the program enters its fifth year this fall, school officials report they're reaching a lot of people besides students with the conservation theme.

"We decided that if we could talk about growing coffee in Brazil, we might very well devote some time to crops we produce in North Carolina and the soil in which they grow," Superintendent Fred A. Smith explained. "We saw this thing had its economic side, too. And the bankers and other groups got interested.

"After 4 years," he continued, "we think we've gotten tangible results. We have found the children are working on something their parents are interested in as a home project. One man told me his son had taught him more about conservation than he'd ever learned before. Anything that can arouse interest like that is very much worthwhile."

Soil conservation district supervisors origin-

ally promoted the poster idea with school officials. Mrs. Katharine Revell, county supervisor of elementary education, wanted to get some materials to give the children background information. George L. Winchester, Soil Conservation Service work unit conservationist, got together the materials and worked with Mrs. Revell on the poster contest.

The contest was soon in full swing. After



Mrs. Katherine Revell (left) and pupil show some of the conservation posters displayed at Apex school, Wake County, N. C.



Sixth grade pupils studying conservation at Fuquay Springs School, Wake County, N. C., Mrs. Katie Ragan, teacher.

studying the materials, the pupils came up with some remarkably good posters on conservation. But to Mrs. Revell's trained eye, here was a subject that had much larger possibilities than a poster contest. She wanted to work up a conservation unit and discussed the proposal with Superintendent Smith.

"We were losing 50 percent of our students between the 9th and 12th grades," Superintendent Smith said. "We saw the need of some sort of terminal education—something that would be reflected in the economy. We think this soil and water conservation unit is at least part of the answer and that the time is well spent."

Mrs. Revell decided to put the unit in the sixth grade for this is when pupils are at the most inquisitive age and when they are most anxious to share with their parents and other people. By that time they have mastered the mechanics of reading, writing, and arithmetic and are ready to relate their knowledge to the life around them, she points out.

During a 6-week period, conservation is integrated with every subject studied, starting with spelling. They study new words that they have run across in conservation material. It is brought into their English classes, where they write compositions on various phases of con-

servation. It is introduced into the social studies. They go back to 5000 B.C. and trace the effects of conservation, or the lack of it, on human history up to the time of George Washington. Dr. Lowdermilk's "Conquest of the Land Through 7,000 Years" is the basis of these studies. They do conservation problems in arithmetic, where they have found the booklet "Down the River" very useful.

The Bank of Fuquay has furnished copies of "Down the River" and the Carolina Power & Light Company has provided copies of "The Story of Our Land." Another popular "text-book" has been "Let's Save Soil With Sam and Sue."

Although the program has far outgrown its original concept as a poster contest, posters are still an important part of it. Ten Lions Clubs in the county provide prizes for the class that has the child with the winning poster. Prizes consist of 2 softballs and 2 bats to the winning room in each school. Ten conservation meetings are sponsored by the Lions Clubs for awarding the prizes.

Youthful imaginations interpret the background information they have acquired into some unusual poster ideas. A poster in Mrs.

(Continued on page 43)

Conservation A Wise Investment

No. 18

This is the eighteenth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By E. L. SAUER

THE basic importance of land to the material and moral welfare of man makes conservation a must. Soil and water conservation measures protect agricultural land while it is in productive use. Soil conservation farm plans build up current productivity and protect the land for future use.

Many farm operators and landowners recognize the need for soil conservation and related improvements. But meeting the expenses for such improvements along with current operating expenses and family living costs presents a real problem for many farmers, particularly those on small or depleted and eroded farms.

As farmers continue to adjust their businesses to obtain the benefits of improved technology, such as new and improved machinery, improved crop varieties, fertilizers, insecticides and pesticides, chemicals for weed control, labor-saving livestock feeding and housing arrangements, they will need larger amounts of capital.

Is it wise to invest in conservation? As conservation sometimes means foregoing immediate income to increase future income, in times of lower net income farmers tend to reduce or eliminate expenses for conservation.

Twenty years of conservation studies indicate that a farmer should not reduce his expenditures for conservation if he is not operating at a high level of conservation. Conservation measures are not only effective in improving and maintaining soils for future use; they are

also important in increasing current farm income. Efficient, high-volume production per acre is essential in maximizing farm returns. High per acre yields help to reduce production costs. Investments in measures to improve the land, including the application of limestone and fertilizers pay off in larger per acre crop yields and in higher quality of hay and pasture. Enough well-managed livestock to utilize forages produced under conservation plans help to increase the volume of farm output.

What is conservation? As used here, conservation includes the use of land within its capabilities; the use of practices that will lessen or prevent harmful soil erosion and water runoff, and improve drainage; and the maintenance or improvement of soil fertility and productivity.

Many farmers are interested in conservation as a means of obtaining large future incomes. Most farmers are also interested in increasing current yields and incomes. There is no serious conflict between these two interests. Present farming programs often need to be changed, and this may require the outlay of additional capital and a temporary reduction in current income. But research in Illinois indicates that this reduction in current income is soon more than offset by increased production and income.

Landlords and tenant farmers frequently overemphasize quick returns. Landlords who do this, however, often find their farms damaged and their income in later years reduced. Tenants, too, find that their ability to succeed as farmers and to rent highly productive farms depends on their acceptance of systems of farming that insure long time high production from the land.

Will conservation and improvement measures pay? In 1955, a random sample of operators of cash-grain farms who followed recommended soil conservation rotations, along with other appropriate conservation practices, spent about 50 percent more for fertilizer and land improvement than farmers with similar soil resources who did not follow a recommended conservation program. Returns were \$32 an acre for

Note.—The author is agricultural economist, production economics research branch, Agricultural Research Service, U. S. Department of Agriculture, Urbana, Ill.

the conservation farms compared with \$23 an acre for the others.

During the last 2 years, high-conservation farms in the northeastern Illinois slowly permeable soils earned \$3.09 to \$7.64 more net income per acre than comparable low-conservation farms. Total capital expense for conservation and related improvements was about twice as great on the high-conservation farms. Expenditures for land improvements and fertilizer have more than doubled on high-conservation farms in the northeastern Illinois area in the last 5 years. Apparently, these farmers are convinced that investments of this kind do pay.

In 1954, in the Hadley Creek pilot demonstration watershed in western Illinois, on farms of similar land use capabilities, yields of corn varied from 23 to 63 bushels per acre and net incomes varied from -\$11.25 to \$25.00 per acre. Expenditures for conservation and fertility improvement varied from zero to \$15.77 per acre. Taxes, interest, land preparation, and, to a certain extent, costs of seed, machinery, and labor were about the same on the high-producing as on the low-producing farms.

Operators of these higher earning farms in the Hadley watershed either had soil and water conservation plans in operation or were developing them. In addition to using sound land use programs and adapted rotations, along with appropriate conservation practices and applications of fertilizer, these farmers followed efficient well-planned livestock programs.

A study of the Crab Orchard Lake watershed showed that the total cost of establishing the recommended conservation programs would amount to an average of \$38.47 per acre for the watershed (1945-49 prices). The average annual total value of crops would be boosted from \$10.88 to \$21.47 per acre by applying the recommended conservation programs. Thus in this relatively low-income area, only 4 years of increased production resulting from the conservation program would pay for the cost of establishing it.

A 1954 study showed that contour farming should increase net returns by \$5.45 per acre because it would permit a more intensive rotation while holding soil losses to a minimum. Stripcropping should increase net returns by \$6.66 and terracing by \$10 per acre.

Farmers on sloping land may choose between

two methods of erosion control: (1) Keeping a high proportion of land in hay and pasture crops and (2) using terraces, stripcropping, contouring, and other conservation practices with a lower proportion of land in hay and pasture. Livestock farmers may choose the first alternative because they have a market for their forage crops. Grain farmers should rely more on terracing, contouring, and other conservation practices.

Farmers who have mainly level land find that a sound soil and water conservation program will (1) improve and maintain soil fertility,



Erosion on "low-conservation farms," northeastern Illinois.

soil tilth, drainage, and water-holding capacity of the soil, all of which are needed for high crop yields and (2) increase farm earnings, improve or maintain the capital resources of the farm, and help improve farm family living.

In a 10-year study in three selected Illinois areas costs and benefits of soil and water conservation practices and complete conservation farm plans were assessed to learn the economic effect on farms. This study is summarized in the bulletin "Soil Conservation Pays Off" (Ill. Agr. Sta. Bul. 575, 1954, reprint 1955).

The 10-year findings showed higher farm production and farm earnings were the measurable result of better soil conservation and fertility-improvement practices. Long-time benefits of soil conservation were significant in each area studied. Conservation and improvement practices, such as contouring and fertilization, generally increased production and income the first year. If the land was badly eroded and depleted, however, much effort, money, and time had to be expended to build productivity and earning power to a high level.

On the individual Illinois farms studied, the total costs of conservation application varied from \$20 to \$50 per acre. At 1954 farm prices, 10-year average net earnings of farms with conservation plans were \$6 per acre per year higher than those on matched farms not having such plans. This difference was about \$1,000 a year for a 160-acre farm, or about \$100 a month more net income for a farm of average size (185 acres) in the areas studied.

Contour cultivation, stripcropping, and terracing permit more intensive crop rotations under given erosion hazards, reduce soil and water losses, increase crop yields, and generally reduce farm operating costs. Improved drainage results in more certain and higher crop yields and reduces operating costs. Mulch farming, on soils subject to erosion, reduces erosion hazards, permits more intensive crop rotations, helps to maintain and increase soil organic matter, and holds water in the soil. Timely irrigation brings higher yields and longer grazing seasons and makes it possible to grow specialized crops. Grass waterways, spillways, flumes, dams, ponds, living fences, and windbreaks contribute to a complete conservation plan when used with proper rotations and adequate fertilization.



Scenes on "high-conservation farms," northeastern Illinois.

Production and incomes on case farms in each area studied were better after they had adopted a conservation plan suited to the capabilities of the land and the abilities of the owner and operator.

In the 10 years from 1939 to 1948, 10 high-conservation farms in Madison and St. Clair Counties had almost twice the total expenditures of 10 low-conservation farms with similar land resources and types of farming (\$25,493 for machinery, buildings and equipment, live-stock and direct conservation expenditures compared with \$13,980 for the 10 low farms).

The 10 high-conservation farms had a 10-year average annual expenditure of \$7.09 per acre more than the low-conservation farms, or \$1,219 more per farm. However, they also had an average annual *net* income of \$8.36 per acre more than the low-conservation farms, or \$1,438 more per farm.

Although more conservation may boost total expenses, returns from the additional farm production that results are usually large enough to more than offset the added cost. The economic use of capital must be determined on an individual farm basis. More and better management is needed along with the use of more capital.

If his capital is limited, a farmer will usually find it most economic to reduce expenditures first for those items that do not affect immediate crop yields.

Conservation improvement wisely made usually returns a good margin of income over expenses. Returns from these investments will not be fully realized in 1 or 2 years, but will extend over a period of years. Consequently, if money is borrowed and repayment is to be made from earnings, loans should be repaid over a period of years rather than on a short-term basis. The amounts of principal to be repaid during the first 2 or 3 years should be less than in the later years when there has been time for the plan to increase the productivity of the soil. As conditions vary from farm to farm by individual borrowers, conservation and improvement loans need to be tailored to the individual farm problems.

In the past, most farmers appear to have invested too little in land improvements. The result is a partial depletion of fertility and incomes that are lower than those that would have resulted had more adequate investments been made to improve the land. This lack of conservation investment is often due to short-tenure expectations on the farm and to the relatively slow returns from land improvements compared with returns from some other investments. The net cash income may actually decrease during the first 2 or 3 years of a conservation program.

Changes in income on the farms studied varied with the condition of the farm when

the programs started, the speed at which the program was applied, the kinds and quantities of fertilizer used, the weather, and the quality of management of owner and operator.

By improving both present and future productivity, a conservation program usually increases net income in 1 to 4 years after it is started. The returns provide a safe basis for establishing credit to put the conservation program into effect.

Successful investment in conservation requires that farmers establish definite goals, develop sound conservation farm plans with approved technicians, and understand and follow the basic principles of farm management.

Some conservation measures may not work out as expected because of adverse weather or because they are poorly adapted to the individual farm. Farmers need to get the best advice available and they may also need to do some experimenting. For this reason, it is probably best to work gradually with a conservation plan rather than to make a heavy investment all at one time. This is particularly important to farmers who may be heavily indebted.

SIXTH GRADERS LEARN ABOUT CONSERVATION

(Continued from page 39)

Martha Jackson's class at Millbrook School is a good example. It shows a cloud in the form of an airplane flying over a conservation landscape. And tumbling out of the cloud comes a horde of raindrops, each wearing a parachute!

Last year Mrs. Jackson's class won \$5 for having the most parents in the PTA. What did they do with the money? They bought 30 scrapbooks to keep their conservation items in. They got the items by writing letters to various sources as a part of their English classwork. Each child selected his own source to write to and they came up with a varied and original assortment of items.

"We like to let the children find their material by their own research," Mrs. Revell says. "And it's surprising what 35 children can come up with, once they've become interested in a subject like soil and water conservation."

A QUICK LOOK AT 4 FEET OF SOIL

By WILLIAM E. McKINZIE

POWER soil samplers have partially mechanized the soil survey business in western Nebraska. By the operation of a small lever, and 30 seconds of time, soil surveyors can have a 4-foot core of soil to analyze. Formerly the soil scientists dug or bored these holes by hand. Anyone who has dug postholes all day knows this is a slow, tiresome job.

By use of the mechanized soil sampler the surveyors obtain information as to depth, texture, color, and permeability of the soil. This information along with the slope, amount of erosion, drainage, and present land use is recorded on an aerial photograph and is called a soil survey. These soil surveys are used by the Soil Conservation Service as a basis for conservation farm and ranch planning, and making recommendations for land treatment.

This spring the Soil Conservation Service put into operation five 1½-ton trucks on which hydraulically operated soil samplers were mounted. The unit is mounted directly behind the cab and is operated by a lever mounted on the left side of the truck box. At each location when the soil is to be examined the soil scientist inserts the 4-foot soil sampling tube into a coupling that is mounted on a vertical driven chain. This chain is coupled to a two-way hydraulic cylinder. By pulling out on the lever the hydraulic cylinder causes the chain to rotate and pushes the sampling tube into the ground. By pushing in on the lever the cylinder causes the chain to rotate in the opposite direction and raises the sampling tube. The sampling tube can be quickly removed and the soil examined.

Farming operations in western Nebraska are carried on in large fields and it is here that the power soil sampling unit works most efficiently. Since many borings must be made to find out about the soil pattern, small fields and many fences are a handicap. In the spring prior to

planting, unless soils are wetter than normal, the power soil sampler can be used on all the irrigated land as well as all the dryland areas. During the summer, there are large areas of summer fallow and rangeland where the unit can be used. Again in the fall, after harvest, wide use of the unit can be made. Here in western Nebraska it is not uncommon to have open winters and with sampling tubes capable of penetrating 6 to 16 inches of frost, depending on organic and moisture content, some mapping can be done during the winter months.



Ed Sautter, area soil scientist, with 4-foot soil sampling tube and power equipped pickup that operates the sampler.

This new equipment not only benefits the surveyor but it increases his accomplishments as well as the accuracy of his work. In the past, the surveyor would carry his map and soil auger and walk over the land. With manpower being the only source of energy less holes were dug per farm; as a result the surveyor had less information to use as a basis for his soil survey. From experience here in western Nebraska a surveyor can increase his acres from 25 to 30 percent.

In addition to the 4-foot sampler, extensions may be added and the soil sampled to a depth of 12 feet. The 12-foot depth of sampling is used in locating dam sites and in drainage investigations.

Note—The author is soil survey supervisor, Soil Conservation Service, North Platte, Neb.

Cow Guzzlers

California ranchers use open cisterns with water-proofed runoff areas for stock water.

By VINCE W. SHALLY
and HOMER W. MARION

FLOYD GRIGORY at San Ardo, Monterey County, Calif., took an old idea, and gave it a new twist. He calls it a "Cow Guzzler." Grigory is a cooperator with the Gloria Soil Conservation District, where they often have a water shortage on about 250,000 acres of rangeland.

What's a "Cow Guzzler"? It's a reservoir (or pond) that receives its water supply from rainfall runoff furnished from a waterproof apron adjacent to it. In other words, it's an open cistern constructed for use by livestock.

Uniform distribution of stock water is necessary for uniform use of range feed. An abundance of range feed is useless unless water is available in the vicinity. This is the problem

Note.—The authors, both with Soil Conservation Service, are, respectively, supervisory soil conservationist, Watsonville, Calif., and soil conservationist, King City, Calif.



Floyd Grigory.



Sheet metal nailed to redwood frame provides the runoff area for this pond.

on many ranches in southern Monterey County. Ranchers and soil conservation technicians in attempting to work out range management programs were stumped because of the poor distribution of water.

Springs are few and far between; thousands of dollars have been spent drilling dry holes; dams received no runoff year after year; pipelines were often either too costly or, in many cases, there was no excess water to pipe.

Grigory, an ex-employee of the State Division of Fish & Game, drew on his experience with the successful "quail guzzler" to come up with the idea of a guzzler for cows. Conservationists later found that several other ranchers in the vicinity, including Herman Eade and the Smart Brothers, had similar ideas. During the past 2 years, 5 such guzzlers have been constructed.

Generally, cow guzzlers should be considered as a last resort after other possibilities for water development have been explored. When no other water source is available, however, they fill the need.

Sites for cow guzzlers are not critical. They can be constructed in flat, open country, canyon bottoms, or on mountain tops. The only limitation is a slope too steep for equipment operation. This wide range of site selection just about licks the problem of water distribution; but the decision to build a guzzler brings other considerations. First of all is the cost. Using road oil for a 1-acre apron, a fair estimate for average cost of a guzzler is \$1,000 to \$1,500.



A paved area across the road plus the hard surfaced road provide the runoff for this pond.

The cost of construction tends to limit the use of guzzlers for winter and spring water supply, especially in the low rainfall areas. Ranchers must consider the number of animals and the length of time for which water is desired. With this information, the engineers can design the size apron and reservoir to meet a rancher's needs.

In designing, consideration must be given to average rainfall, runoff, evaporation, and seepage loss. For example, in southern Monterey County, with an average rainfall of 11 inches, it is estimated that only 8 inches comes in storms of sufficient duration and intensity to contribute water to the guzzler reservoir. Reservoir seepage must be held to a minimum; lining may be necessary. Evaporation is an important item, especially if water is desired for summer or yearlong use. Fencing is required to protect the apron and reservoir from damage by trampling of livestock. The water is usually piped by gravity to a trough.

Design is based on the engineer's best information on the above factors. Guzzlers designed to date, in this 11-inch rainfall belt, supply water for about 100 cows for the winter and spring months with a 1-acre apron.

Evidence that ranchers are taking to the idea is shown by the fact that several additional requests for assistance in guzzler design have been submitted to directors of the Gloria District.

CONSERVATION PAYS—A 10-year study in 3 Illinois areas shows that an investment of \$25 to \$60 an acre in conservation practices often results in an extra \$1,000 profit each year from a 160-acre farm.

TRAILER OFFICES

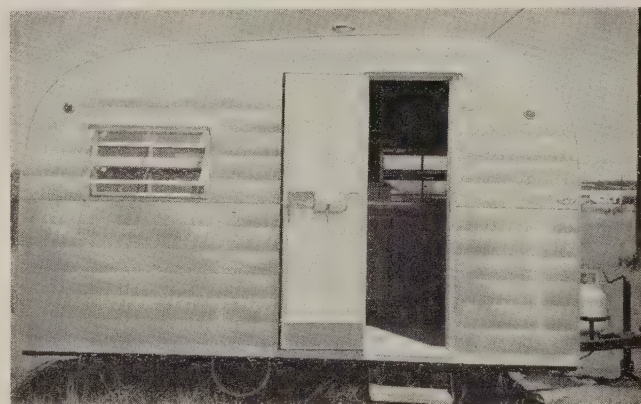
By TARLETON JENKINS

TRAILER field offices, which can be whisked to a new site by a pickup truck, have been moving into service in Texas and Oklahoma on small watershed construction work.

They are replacing frame office units that took considerable time to move (five man days on the average) and usually lasted only through 5 or 6 jobs before being claimed by the rubbish heap.

The trailer-type offices were first devised by Franz E. Bleckert of Fort Worth, construction engineer, and Glenn A. Beecham of Clinton, Okla., engineer assigned to the Washita River watershed.

A trailer field office may stay at one site until the job is finished. But since a contractor generally performs preliminary work on one structure site and then moves to another while waiting for concrete on the first site to "cure," the Soil Conservation Service engineer usually



Trailer office used in small watershed construction work, (above) exterior view, (below) interior view.



moves along with the contractor to each temporary site.

Blackert had been looking into the possible purchase of used school buses to be remodeled for this purpose. Then Beecham one day in Fort Worth spotted a house-trailer factory in operation. He sold Blackert on the idea.

Blackert designed the unit. Bid invitations were mailed. A contract for 16 units was let on a bid just over \$900 per unit.

Floor space in each office is roughly 8 by 12 feet. They have a built-in desk and a work bench with hot plate for drying soil and concrete aggregate samples. A wall heater is ready for winter use. Fuel is butane, from tanks mounted on the front of the frame.

The exterior is aluminum, interior varnished plywood. Windows on all sides give ample ventilation. Glass fiber insulation is 1½ inches thick, with vapor barrier and aluminum foil sheeting to help. Axles and framing are heavier than ordinarily used so as to withstand hauling over rough terrain.

The idea already has clicked elsewhere. Soil Conservation Service people in other states are interested. And an oil company executive who saw one of the units placed an order for his firm.

PUBLIC SERVICE AWARD.—William R. Van Dersal, an assistant administrator of Soil Conservation Service, is 1 of 16 career civil service employees of the Federal Government granted the Rockefeller Public Service Award. He expects to take a year's leave from the Service, beginning about September 1, 1956.

Van Dersal says he plans to spend the year studying the way in which renewable natural resources are managed by governments—Federal, State, county, municipal, and special purpose governments organized to deal with various specific resources.

The study will involve a review of governmental organizations, staffing, functions, policies, attitudes, and administrative habits and customs; also the general operating techniques and procedures by means of which the governments develop and conduct their programs aimed at the management of natural resources.

"During the course of the study," Van Dersal states, "I plan to review the legal as well as the

administrative and financial arrangements that facilitate or handicap an integrated attack upon the problems of resource management. The work will necessarily involve consideration of the proper sphere of activity as between the Federal and State Governments.

"I expect to headquarter in Washington, D. C. and review the manner of operation of several Federal agencies, and discuss basic questions with various members of the executive, legislative and judicial branches of the Government and do research in the Library of Congress.

"Field work will involve a study of six or more States to gain firsthand information about their way of managing natural resources. In addition, I expect to do some work in Canada, Australia, and New Zealand. Comparison of their institutes with American institutes ought to be of considerable value."

Although Princeton University, which administers the awards, does not require formal reports Van Dersal states that he will write up his major findings for publication at the end of the year.

DISTRICT HELPS LIBRARIES.—The fourth annual \$25 donation by the Whatcom County Soil Conservation District was made to the Whatcom County and Bellingham, Wash., libraries last spring. Approximately 10 books each year are added to the growing list of books on all phases of conservation of natural resources. Both city and county libraries have full use of these books and they are also included in the county bookmobile program.

The district supervisors feel that a small annual donation will enable the libraries to purchase several new books each year and so keep current up-to-date literature on conservation available.

PAPER MILL EXTENDS FIRE PROTECTION.—The Hiawassee Land Company, a subsidiary of Bowaters, has fire crews and fire lane plows for use in putting out woods fires on their own land.

Supervisors of the McMinn County (Tenn.) Soil Conservation District contacted Allen P. Swayne, district forester for Hiawassee Land Company to find out if the fire crews could be made available to farmers to supplement the protection being provided by the State fire crews since most of the district cooperators are customers of the paper mill.

As a result, the supervisors and the Soil Conservation Service technicians, working with the district, are authorized to call the Bowaters' fire crews for help when State crews are not available.

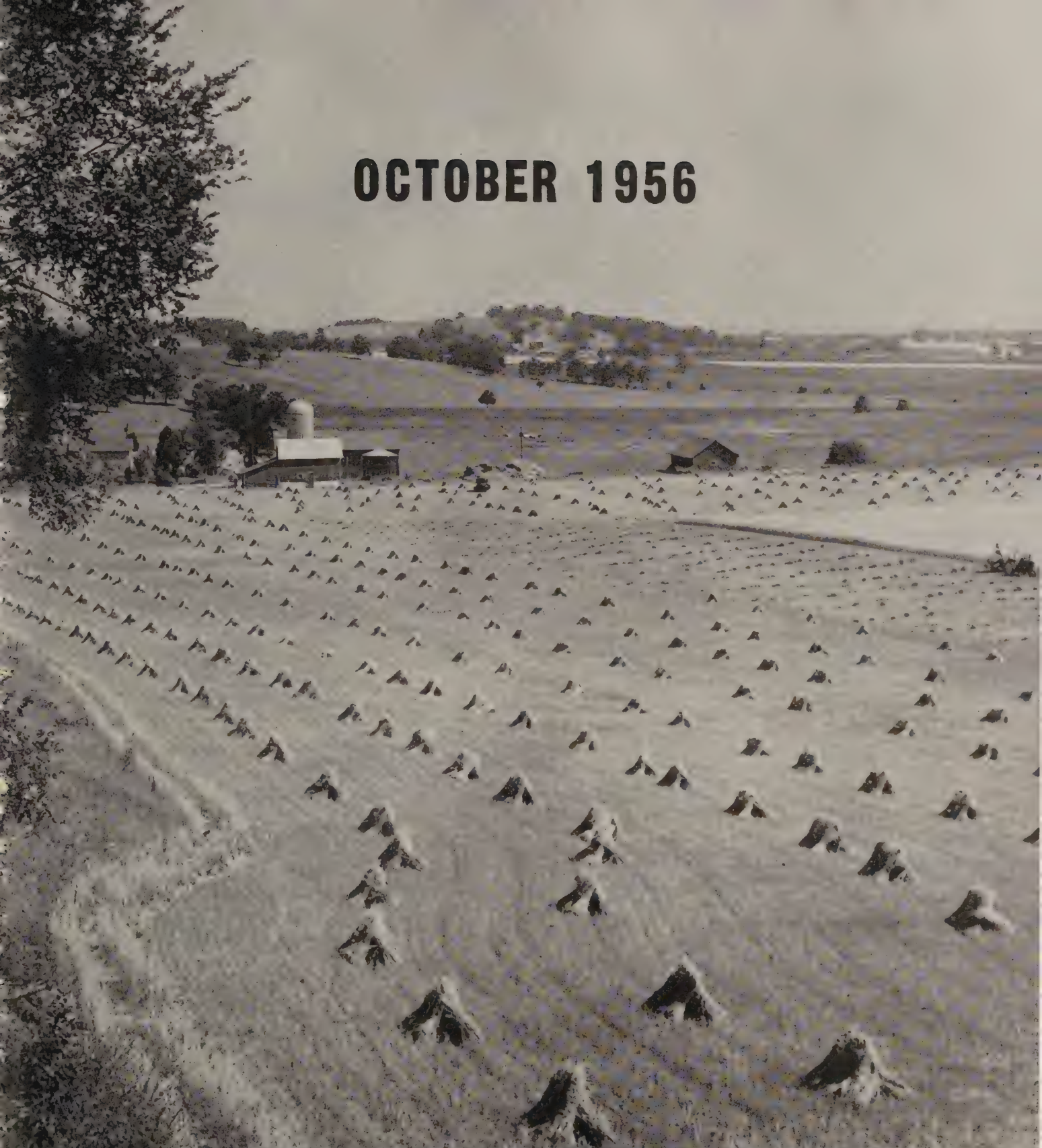
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WEB-FOOTED HOE HANDS.—This flock of geese on the Forrest Keeling Nursery near Elsberry, Mo., do the work of 20 laborers in keeping down weeds, according to Hugh Steavonson manager of the nursery. Steavonson admits, however, that he still must hire a few human hoe hands because the geese refuse to eat such weeds as smartweed and wild onion. Photo by Sam Caldwell, used through courtesy of *St. Louis Post-Dispatch*.

An aerial photograph of a rural landscape. In the foreground and middle ground, a large field is covered with numerous haystacks arranged in a grid-like pattern. In the background, there are several farm buildings, including a barn and a silo, surrounded by trees. The sky is clear and light-colored.

OCTOBER 1956

Soil Conservation

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION.

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SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
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OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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SHELTERBELTS FOR NEIGHBORS.—Joe Nilles and Garth Garrett live on adjoining farms near Blanchard, N. Dak. A township road running east and west separates the two farms. Joe Nilles' farmstead is on the south side of this road and Garth Garrett's buildings on the north side.

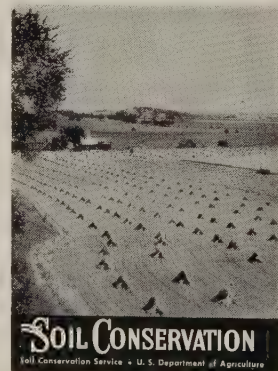
Joe Nilles had a good shelterbelt on the south side of his farmstead. His buildings were too close to the road to permit an adequate shelterbelt of trees on the north side. Garth Garrett had a shelterbelt on the north side of his buildings, but was too close to the road for a shelterbelt on the south.

They got together. Each agreed to plant a shelterbelt on his own land to benefit the other.

As a result, application was made to the Southeast Traill County Soil Conservation District and the shelterbelts were planted. Both Garth and Joe take pride in caring for these tree belts that serve mainly to help their neighbor.

WALTER G. BOHNSACK

Editors are invited to reprint material originating in this magazine.



FRONT COVER. — Harvest scene in Wisconsin.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

"It Was Timberland All Along"

As their eroded cottonfields of three decades ago were diverted, first to corn, then to cattle pasture, and now are being planted to pine trees many Louisiana farmers are beginning to realize that their land was best suited for timber all the time.

By BARRINGTON KING

TREE planting is spreading like wildfire in Louisiana.

And conversely, thanks to the watchful eyes and educational efforts of the Louisiana Forestry Commission, wildfire is diminishing as interest in tree planting grows.

Soil conservation districts are taking an active part in the big push for better woodland management in the State. They consolidate orders from district cooperators for seedlings and receive bulk shipments from nurseries. Then they deliver trees to individual farmers and collect for the trees as the planting job is done.

Soil Conservation Service technicians assisting the districts are giving technical aid in selecting planting sites, reforesting wornout fields and cutover land, girdling old hardwood stands to release pine reproduction, checking survival, and in thinning and harvesting operations.

Records compiled by the SCS show that more than 27½ million trees were planted by farmers cooperating with local soil conservation districts during the 1955-56 planting season. This figure includes 12,657,633 trees purchased through soil conservation districts, 11,206,500 purchased by district cooperators directly from nurseries, and 3,669,400 furnished free to district cooperators by various companies, agencies, and others.

To date, 2,424 farmers cooperating with local soil conservation districts have planted 127,367 acres to trees. In addition, 4,041 cooperators have carried out woodland jobs other than tree planting on 461,062 acres. And in all, 5,685 cooperating farmers have completed at least one woodland improvement practice.

State and paper company nurseries are producing trees in record numbers. N. W. Sentell, vice chairman of the Louisiana Forestry Commission says the two State nurseries at Oberline and Sibley produced 42 million pine seedlings during the 1955-56 planting season. They hope to hit the 45 million mark this year.

Sentell is also president of the Southern Pulpwood Conservation Association and chief forester for a bag and paper company. He reports that his company produced 4½ million trees last year and bought another million from the State. This company has furnished nearly 9 million free trees to farmers in a 36-square-mile area during the past 8 years, including 1½ million last year.

"If we are going to give seedlings away," he says, "we want to be sure they're handled and planted properly. The Soil Conservation Serv-



Guthrie P. Martin, left, and Linton Jones of SCS examine a young pine at the beginning of the second growing season.



W. R. Jackson inspects his 4-year-old pine trees on his farm in Bienville Parish, La.

ice is the catalytic agent between the nurseries and the farmers. They've taken a big load off us by seeing that the planting is properly done. And I've never seen a bad job of planting where the SCS was involved."

But just getting the trees planted properly is not enough. They must be protected from fire, too. And that's where the Louisiana Forestry Commission is doing an exceptionally fine job, along with its assistance to farmers in their marketing operations.

"We are reaching a milestone in our forest fire prevention program," Sentell says. "During the last 12 months, our fire prevention officer arrested many people for starting illegal fires and got many convictions and fines."

L. C. Ewing, of Chatham, in the west central part of Jackson Parish, owns 2,000 acres of woodland. He is part owner of 2,500 additional acres and manages 20,000 acres of woodland for other landowners. Ewing, who is 43, indicated how interest in woodlands has grown. "During my lifetime," he says, "I've seen this parish change from row cropping to tree farming."

As a cooperator with the Dugdemon Soil Conservation District, Ewing reports that he has received invaluable help from SCS technicians in woodland planning. This is supplemented by help from the Louisiana Forestry Commission in marking timber and in fire control.

He gave two examples of the kind of assistance received from the SCS. "We had a tract of 80 acres where we were planning to girdle the hardwood and plant pine. We called in the SCS men for advice and they made a check of the tract. They found we had a 65 percent stand of hardwood, so they advised us to farm it as a hardwood stand.

"A widow with 600 acres of woodland asked the district for a management plan," he continued. "SCS technicians developed the plan on the basis of six compartments outlined on an aerial photomap of the land. Now she knows where she will harvest her timber each year, and approximately how much income she can expect over the years."

Banks, too, are getting interested in the economic phases of the booming woodland program. Ewing says he met recently with the directors of the People's Bank of Chatham and they agreed to help sponsor tree planting by taking orders, receiving shipments of seedlings, helping with loans, and so on.

"We want to increase woodland planting in the Chatham area a hundred percent this year," Ewing says.

Paul Stinson, vice president of the Jackson Parish Bank at Jonesboro, and also a district cooperator, was so convinced of the soundness



Homer Watkins, left, and O. O. Moore of SCS look up to some 8-year-old slash pines.

of the woodland development program that he arranged for the bank to buy a tree planter. It was turned over to the district to operate.

The forester's slant on the economic possibilities of sound woodland development is expressed by M. A. Peters, SCS woodland conservationist at Alexandria.

"The thing that impresses me," Peters says, "is that the average timber production in Louisiana is only 50 board-feet per acre per year. But with proper woodland management, this can be increased to 500 board-feet per acre per year.

"You can double the yield of cotton, and corn yields have been quadrupled by the use of hybrid seed and better farming practices," he points out. "But you can increase the average woodland production tenfold. I don't know of any other crop with possibilities like that."

O. O. Moore, SCS area conservationist at Alexandria, who has seen interest in woodlands constantly increase since back in the CCC tree planting days, looks at woodland from the land use viewpoint.

"Half the State of Louisiana is tree land," Moore says. "People in these hills have decided they can't make a living with row crops. But with 50 inches of rain and adapted soil, trees are just about the ideal crop."

Sixteen years ago, Moore stopped by the house of Homer Watkins, who has a 132-acre farm in Jackson Parish. It was a Saturday afternoon, and Moore had been hunting. But as he tramped over the hills, he had been thinking too about what should be done with the rough, eroded land.

"You know what you ought to do," he told Watkins. "You ought to plant about half of this farm to trees."

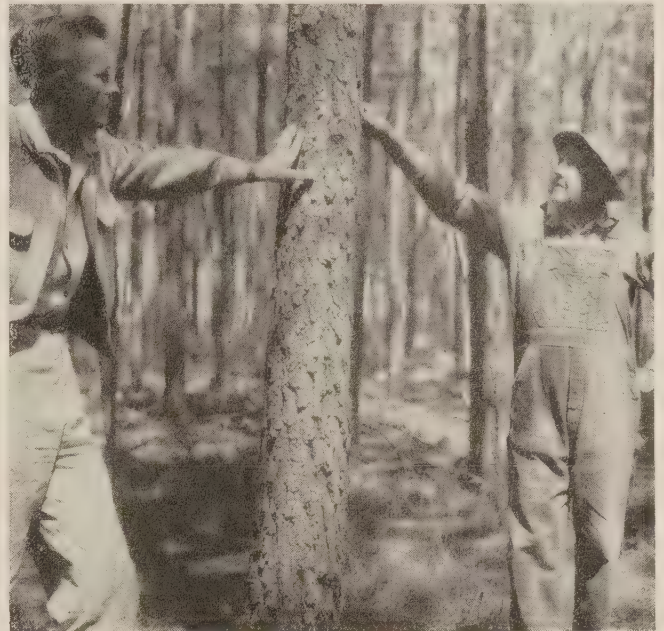
The idea didn't appeal to Watkins at the time, although the trees were free and the CCC boys would plant them. He reluctantly agreed to allow pines to be planted on 3½ acres of his roughest land.

As he watched the young pines grow, Watkins got interested. A few years later he began planting pines on his own, with the technical help of the local soil conservation district. He has gradually taken his steep land out of cultivation and put it in pines and has spot planted pines in hardwood areas. He now has 24 acres of slash pine in pure stands.

The first planting made in the CCC days is now 16 years old. The trees are 40 feet tall, vigorous and thrifty. Three years ago he got a pulpwood cutting from the 3½ acres that netted him \$40 an acre from land that originally cost him \$25.

"If I had listened to him back in those days," Watkins said as he nodded his head toward Moore, "I'd have most of this land in pines like that now. Fact is, I expect to have it all in pines in a few more years, by the time I'm 65. I set out 6,000 this year.

"I expect to leave about 5 acres of open land around the house for a garden, on account of my wife. She says she's not going to let me plant pines around the house. In 6 months time, she claims, they'll be so thick we won't be able to see who's going up and down the road."



Linton Jones, left, and Homer Watkins, landowner, examine some 16-year-old slash pines that were planted by CCC boys.

Another old timer who has caught the tree planting fever is Guthrie P. Martin. Martin, who is 76, says he has been planting trees for the past 3 years as fast as he could get the seedlings. He planted 15,000 this year.

"I don't expect to get much from them myself," he explains. "I'm doing it for my children. I want to keep them from missing it like I did. I had a chance at this timber when I was young, but I couldn't read the future."

Martin says he got interested in trees by watching old fields that were being planted. He was planting some trees in a field by his house when Linton Jones, SCS technician in Jackson Parish came by. He told Jones he was interested in planting trees on a 29-acre tract.

Since that time, Martin has planted 50 acres of young pines and has done timber stand improvement work on 74 acres, where with Jones's advice he girdled hardwood overstory to release the pine reproduction.

"He showed me how to plant and how to thin," Martin explained. "And the other day he showed me something I didn't know. If you get the roots bent up, the tree won't grow. And if you're setting 40,000 trees, you might get 1,000 that way, if you don't watch it.

"Another thing he showed me," Martin continued, "was that little gimlet thing they use to get the age of a tree. That shows you how much more you can get if the trees are not shaded or crowded. If you work on your timber, like you do a crop, there's a lot more to it. You can't make any kind of crop with

half a stand."

Martin thinks the reason more people are not interested in trees is that it takes so long to learn about tree values through personal experience. He recalls that when he was married 50 years ago, he saw corn growing on wornout fields that are now supporting valuable stands of timber.

"I've been talking to all the young boys, showing 'em where the money is," Martin went on to explain. "A young fellow said to me the other day, 'You can prove anything on paper.' But I told him when you get as old as I am, you don't have to guess about trees, you know."

"I've been in this same area for 65 years," Martin summarized. "I've seen it go from cotton, to corn, to cattle, to timber. Now cattle is going out and it's all going to timber. We have a wonderful country if we just knew it. It was timberland all along."

And judging from the way people in Jackson Parish and many other areas in Louisiana are turning to trees, it is obvious that a lot of them are beginning to think as Martin does.

Can We Save Our Organic Soils?

By JOHN C. STEPHENS

No. 19

This is the nineteenth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

CITY VEILED IN SMOKE, AIRPORTS CLOSED, MOTORISTS FIGHT PALL

Such headlines in Miami newspapers during April 1956, together with editorials, radio broadcasts, and television programs served notice to the people of Florida's lower east coast that the Everglades was again being ravaged by fire.

The vastness of the Everglades instills a feeling of permanence to a vacationing populace which is shocked with the knowledge that this seemingly ageless swampland, periodically ravaged by raging fires in the past, is slowly, but inexorably, disappearing in the huge clouds of acrid smoke that hang like a pall over the metropolitan areas.

Fortunately, fires in the Everglades of the magnitude suggested in April's headlines are a rarity, and normally burn only during the most severe droughts. Further, much is being done to combat them. Perhaps from a conservation viewpoint occasional fires are helpful. They are spectacular. They make the headlines. They

Note.—The author is research project supervisor, soil and water conservation research branch, Agricultural Research Service, Fort Lauderdale, Fla.

serve notice to the public that Florida's black gold, the rich organic soil of the Everglades, is in danger.



Uncontrolled fire burning in dense sawgrass of the Everglades.

Unknown to the general public, however, it is not fire but the less ostentatious, insidious loss brought about by micro-organisms that consume the organic soils that is the greatest threat to the peat and muck soils of the Everglades.

The main causes of subsidence—loss of surface elevation—in peat and muck soils are: shrinkage due to drying, loss of the buoyant force of ground water, compaction, burning, wind erosion, and last but not least, slow biochemical oxidation. All of these are set off largely by drainage.

Peat and mucks are created only in the presence of nonaerobic micro-organisms that are largely responsible for the transformation of vegetation to peat. Thus, organic soils are formed in bogs, marshes, and swamp forests, or from the moisture absorbing sphagnum mosses.

In the case of the Everglades, the organic soils were formed in a shallow sedimentary trough of limestone approximately 100 miles

long by 40 miles wide, extending southward from Lake Okeechobee to the sea. In past geologic times, Lake Okeechobee, a circular fresh water lake about 725 square miles in area, overflowed its south and eastern rim during the wet seasons.

During the Wisconsin ice age when the seas were around a hundred feet below the present level, the waters flowed unhindered to the coastline. As the glaciers began to melt, about 11,000 years ago, the seas rose in response. Approximately 5,000 years ago sea levels had risen to the extent that fresh water backed up in the Everglades basin rose to a level conducive to the accumulation of organic soils, rather than to calcareous deposits.

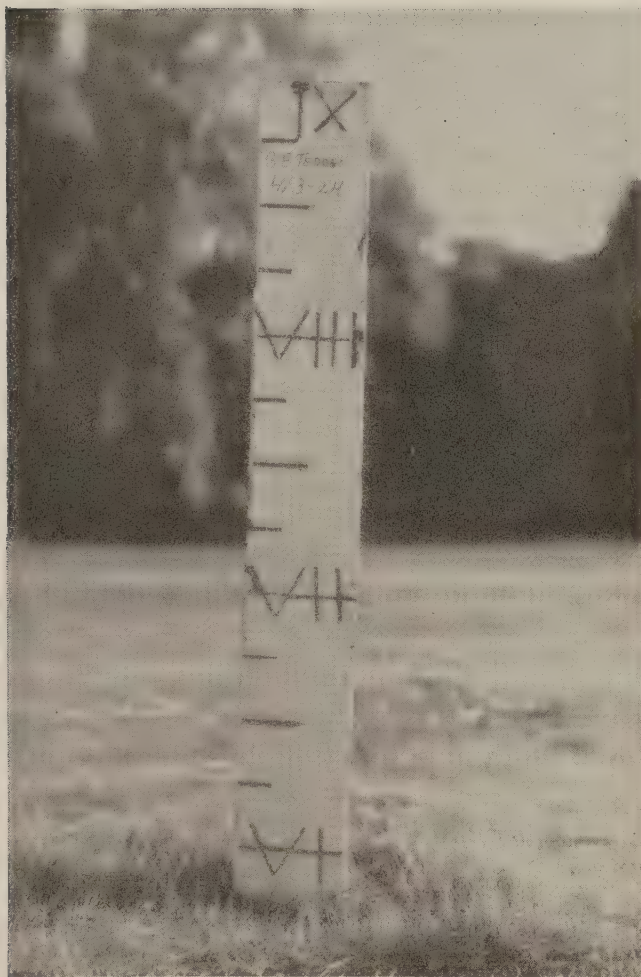
Lake overflow, together with an annual rainfall of more than 60 inches, moved slowly through the thick vegetation over the almost level plain to escape eastward through a few small rivers cutting through the east coast barrier ridge, to pass eventually to the sea through dense mangrove forests at the tip of the peninsula.

Near the rim of the lake, silt, clay, and organic colloids were carried in suspension to intermix with the remnants of plants to form mucks. In the ancient floodways, along the margins of the swamp, submersed aquatics formed a light, almost flocculent, sedimentary type peat.

The vast majority of the Everglades soil, however, was derived from sawgrass and related marsh plants, that formed a light, felty, brown-fibrous, low moor peat with low mineral content. This peat, when drained, properly fertilized, and augmented by minor elements, breaks down into an excellent field soil. Today this soil, together with the mucks, constitutes one of the richest agricultural regions on earth.

The annual agricultural return from this area—even in its relatively undeveloped state—is estimated at approximately \$50 million. It is truly black gold. However, if soil subsidence continues at present rates, most of these organic soils will be worthless for agricultural purposes in less than 50 years.

Early attempts to drain the Everglades were made as long ago as 1850. They were not effective and water levels stayed high enough to maintain anaerobic conditions which permitted buildup of the organic soils to continue. Beginning about 1906, this condition was upset by



The top of this concrete monument was level with the ground surface when the marker was placed in the peat soil of the Everglades in 1924.

the installation of canals leading from Lake Okeechobee to the sea. While drainage was unsatisfactory from the standpoint of farming, the water balance was disturbed to a point where aerobic, or oxidizing, conditions prevailed.

Thus the processes of accumulation were reversed and depletion of the soils began. In 1940 when the Soil Conservation Service began its investigations in the Everglades Drainage District the "Glades" were aptly described by a local farmer as "the biggest, flattest, blackest, sometimes the wettest, and again the driest and burningest area you ever saw."

Today, permanent benchmarks established at the ground line by earlier investigations now stand several feet higher than the land and furnish visual evidence of soil loss. A concrete monument set at the Everglades Experiment

Station in 1924 shows a subsidence of $3\frac{1}{4}$ feet during a 30-year period. This has occurred on land completely protected from fire. It is a necessary practice at the experiment station, where the houses are built on piling, to add a new step about every 10 years as the ground subsides.

The normal pattern of subsidence has been established by running periodic surveys over selected profile lines. The first profiles were run in 1916. Each line is approximately 1 mile long and begins at a permanent benchmark. Normal procedure is to resurvey these lines every 5 years, whereby the average elevation over the entire length of the line gives the ground height at the time of survey. These elevations are plotted as a function of time and show graphically the rate of soil subsidence.

Surveys made by different drainage agencies for the upper Everglades agricultural area show a total loss of soil volume of about 40 percent during 40 years of drainage. This area consists of soils suitable for agricultural development according to Soil Conservation Service land capability surveys. Essentially, this area is a thousand-square-mile tract of sedge peat and muck soils that were 5 feet or more deep at the time of survey. They directly overlie adamant limestone and embrace an area surrounding the southern portion of Lake Okeechobee.

It was found that soil losses were greatest near the main drainage canals where wide subsidence valleys were formed along either side of the channels. However, lands remote from the immediate drainage influence had also subsided and losses in the undeveloped lands were almost as great as in the lands under cultivation.

Fire has been a factor contributing to losses in the wild lands, but on farmlands fires usually are extinguished before they do much damage. Wind erosion may be troublesome on individual farms, but the Everglades area is so large that soil blown from one field usually drifts to another field.

The fact that oxidation is the main culprit causing soil losses has been established by studies on water table plots at the Everglades Experiment Station, Purdue Experiment Station, and other controlled plots.

At the Everglades Station in 1934, a field of Everglades peat was divided into 8 blocks, 100

x 240 feet, and provided with a system of ditches, underdrains, and check dams so the water table could be held at any uniform depth desired. All blocks were uniformly cropped at the same water levels the first year to determine any soil variability. Levels were run and soil samples were taken to establish ground elevations and soil density for each block.

Water levels ranging from 12 to 36 inches deep and varying about 6 inches between blocks were held from 1936 to 1943. Surface levels were rerun and peat samples obtained each year to determine elevation losses and any compaction changes. Soil gases were also collected and quantitatively analyzed.

The rate of subsidence was found to be directly dependent upon the depth to the water table—the higher the water table the lower the soil loss and vice versa. The density and mineral content studies showed compaction to be a minor factor, and a check on implanted metal reference plates showed that all soil losses took place above the water table. From the soil gas

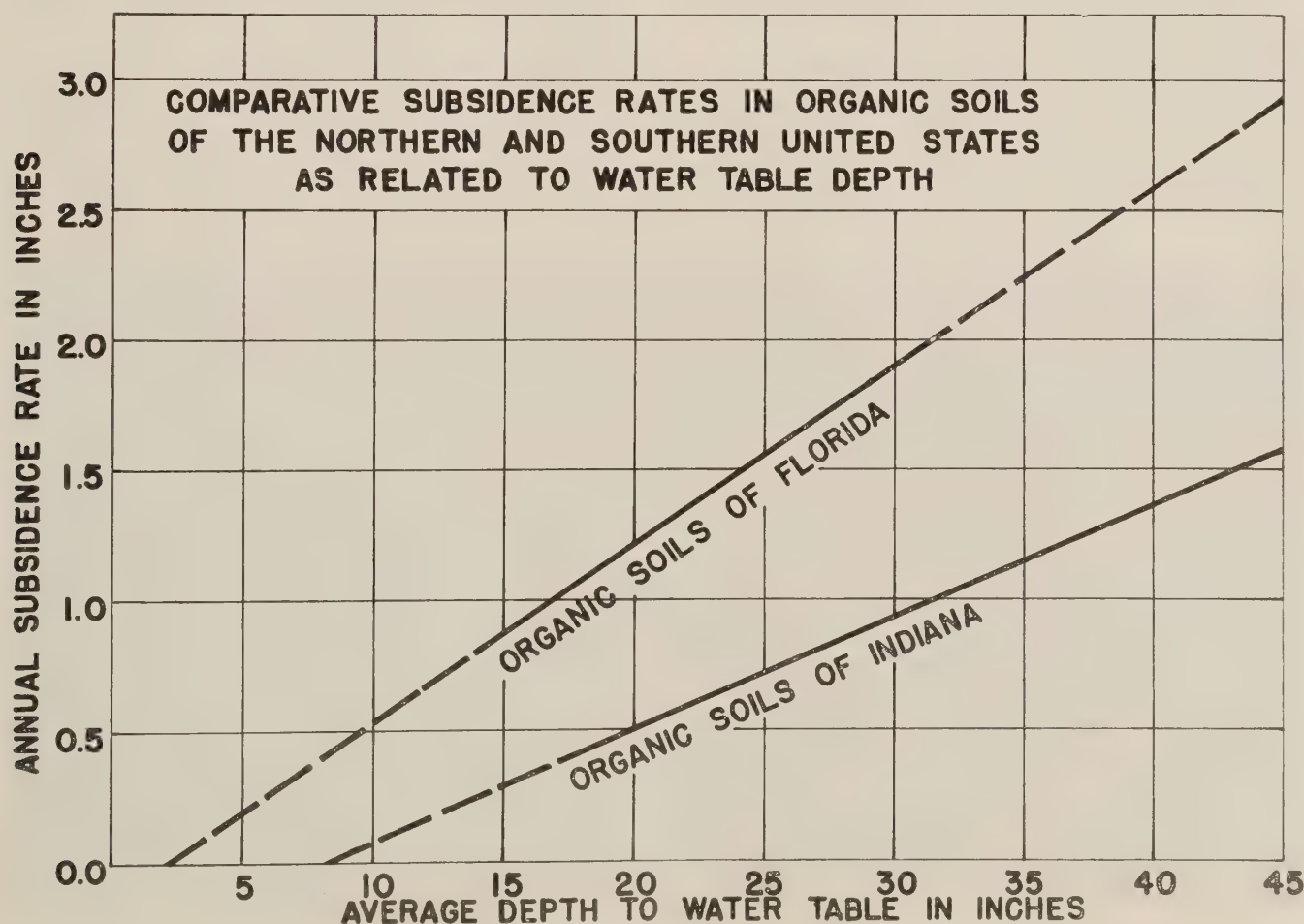
analysis it was found that the production of carbon dioxide (CO_2), a byproduct of oxidation, was in direct relation to the amount of soil loss.

For average water table depths of 12 inches, 24 inches, and 36 inches the corresponding annual subsidence rates were about 0.6 inch, 1.4 inches, and 2.3 inches. Results of these studies are summarized, along with similar studies in Indiana, in the accompanying graph.

All studies point to the conclusion that with continued subsidence, the organic soils in the upper Everglades will probably be too shallow to support a paying agriculture by the year 1990—at least, an agriculture of the present pattern.

The question, “Do other organic soils subside with drainage?” often comes up. When answered in the affirmative, the next question is: “How do losses in other areas compare with recorded losses in the Everglades?”

The losses vary, but a few examples will give a clue as to what to expect. At Purdue University’s Muck Crop Experiment Station, on con-



trolled plots similar to those at the Everglades Experiment Station, the rates of subsidence for like depths of water tables were about half those for Florida. However, due to climatic differences, the prescribed water table was held year-round in the Florida experiments, while in the Indiana experiments the water table was controlled during the crop year from May to September.

In the organic soils of the Sacramento-San Joaquin Delta of California it is reported that the average rate of subsidence is slightly over 3 inches a year with no indication that this rate is decreasing. Those soils are tule reed peats with an average remaining depth of from 10 to 12 feet.

In Michigan losses in surface elevation on organic soils ranged from 0.0 to 0.7 foot over a 5-year period. Near Hennepin County, Minn., the total settling varied from 0.5 foot to about 1.1 feet with the variation being approximately proportionate to the depth of water table.

In the Great Meadows muck area of New Jersey subsidence has uncovered the underlying mineral soils in many places, especially on the outer edges or rim of the muck basin.

In England a loss of 10 feet 8 inches in elevation occurred between 1852 and 1932 in the peat-covered Finlands.

Subsidence occurs even in the extremely cold

climate of Norway. A report shows a loss of 4 feet 11 inches in 65 years for cultivated bog soil at Stend Agricultural School in Hordaland County. From this and observations on 33 parishes, an average loss of about 0.8 inches per year was shown.

In the laboratory studies samples of low moor peats (those with pH's from neutral to basic) about 20 percent of the dry weight was decomposed in a period of 19 months at a moisture content of about 70 percent. Most of the loss was accounted for as escaped CO₂. It was found that the organisms causing decomposition were active only when soil temperatures remained about 40°F.

Soil destroying bacteria were found to be highest in drained low moor peats and lowest in the extremely acid, high moor peats. However, when the acid peats were limed, manured, and put under cultivation, the micropopulation increased to about the same as that in the low moor peats under similar drainage.

So far, all studies point to the certainty of organic soil loss when drained. Thus, the original question, "Can we save our organic soils?" remains unanswered.

Obviously, from a conservation viewpoint, organic soils should not be considered for development until there is an immediate need for their use. If needed, the first step should be to



Truck crop harvest on the organic soils of the Everglades.

determine if the soil is suited for the intended crop. In general, the acid peats are less valuable for most farm crops than the high lime peats; although special crops such as cranberries may be grown on acid peats, and some acid peats may be made productive by the addition of considerable lime.

As a general rule, fibrous and woody peats are better for agricultural use than the sedimentary and moss peats. Most mucks contain mineral admixtures, which are more likely to supply potash and the microelements needed for plant growth, that tend to make them inherently more fertile than the peats.

It should be emphasized that organic soil should be at least 3 to 5 feet deep to justify drainage costs where the underlying material is hard rock or other untillable material. Where the peat or muck overlies fertile, tillable soil the situation is different, and even shallow bogs may pay for cultivation.

Once organic soils have been drained, well regulated water tables offer the best means of minimizing subsidence. Each farm, therefore, needs a complete system of water control to provide drainage in wet weather and irrigation during dry weather. Control of ground water levels is desirable not only for conservation of the soil, but also for attaining maximum crop production, and for frost protection.

Reports of crop yields from controlled water table plots indicate that a water table of 24 to 36 inches is desirable for most field and truck crops, but that mint, celery, canes, and pasture grasses will do best at shallower water tables of 18 inches, while grain and field corn may require deeper water levels up to 40 inches for best results. In arid regions these levels may be higher and in humid regions lower. In any event, the water table should be held as high as crops and field requirements will permit.

It is evident, however, that even with farm water tables controlled for optimum crop production, the rate of subsidence will still continue at an undesirable rate. On seasonably cropped lands where winter temperatures are not low enough to halt bacterial action, such as the Everglades, flooding during the idle season will lengthen the life of organic soils.

Growing water-tolerant crops such as rice or

kenaf would add many years to the life of peat soils. However, numerous research and development problems must be solved before many of the more water-tolerant crops can be grown commercially on organic soils.

Using the carbon 14 radioisotope method, the age of the Everglades soils was found to be 5,000 years. This represents an average accumulation of about 1 foot of peat in 400 years. When it requires only 10 years for the same amount of soil to be lost by oxidation the value of plowing under litter or cover crops for combatting oxidation losses is doubtful.

In fact, some studies indicate that the increased aeration with a consequent buildup in bacterial population from turning under green manure crops results in increased oxidation losses. On the other hand, it has been observed that the incorporation of heavy woody plants may improve the soil structure and tend to stabilize it against wind erosion.

The use of a roller to firm the soil is beneficial in reducing soil loss from both blowing and oxidation. Also, compaction allows the roots to come in closer contact with the soil. It facilitates the capillary rise of water from below, which benefits germination, decreases frost hazards, and reduces wind erosion.

Although it may be impractical at present to completely stop organic soil losses, there are several steps that may be taken to obtain maximum benefits from these soils: (1) Provide adequate water control facilities for keeping water tables as high as crop and field requirements will tolerate; (2) drained lands should be placed in productive use as soon as possible; (3) research should be intensified to develop practices that may prolong the life of these soils.

An increased public awareness of the seriousness of the subsidence problem with the consequent increase in the use of better water control practices may add to the life of peat and muck soils. In general, however, large scale abandonment of such areas as the Everglades in the not too distant future is the logical result to be expected in the light of present knowledge. Furthermore, to varying degrees the same ultimate fate may be in store for drained organic soils the world over.

(Continued on page 72)



Urbanization of Farm

About a million acres of productive farmland are being converted to nonagricultural uses as suburban homes, highways, and other urbanization developments. This increasing loss of farmland creates many new problems to soil conservationists and concerns in the

By D. A. WILLIAMS

NO longer may the problems incident to the growth of our towns and cities and the extension of our streets and highways be looked upon as matters that can be left to taxing, utilities, and other authorities or bodies concerned with just the physical developments themselves. Urbanization, in the broader sense of good land taken out of agricultural production, has been jumping across farm fence lines too fast and far to be ignored by rural landowners or anyone else concerned with the Nation's agricultural economy.

Even a casual check of the day-by-day news confirms this rapidly growing urbanization trend. You are reminded of it when you read, for example, of a Congressional bill that allows Washington metropolitan police and firemen to live as far as 20 miles from the city instead of within the 12-mile area to which they were limited. The Bureau of the Census says 1 out of 7 workers in the United States lives in and commutes from another county than the one in which he is employed.

The impact of urbanization also is reflected in such reports as that of Montgomery County, Md., adjoining Washington, D. C., where more than 32,000 dwellings were constructed between 1950 and 1956. The Census Bureau reports a 77 percent gain in the county's population during this 6-year period. Or take Fairfax County, Va., another Washington suburb, about which the Virginia Agricultural Experiment Station

recently published a warning that the stripping away of topsoil and vegetation, and the building of houses on the flood plain as part of the expanding suburban development is paving the way for serious flooding. Fairfax County's population increase since 1950 has been nearly 80 percent.

The story is much the same throughout the Nation where bulging urban and industrial centers push out into the surrounding countryside.

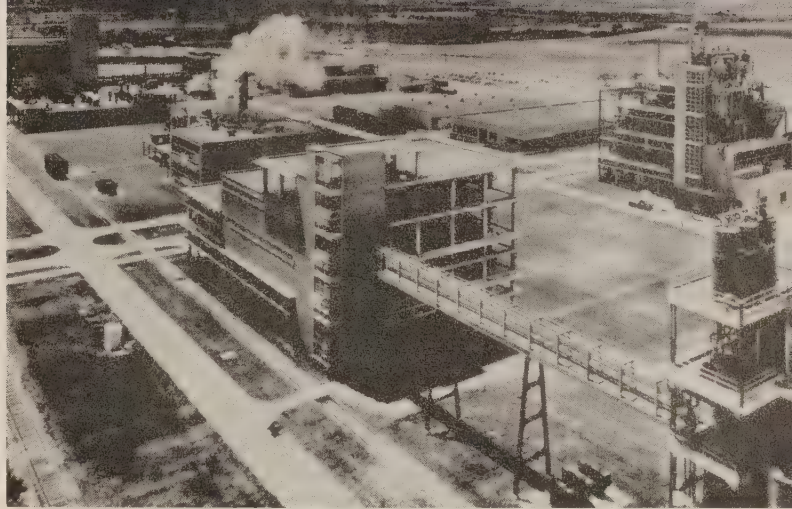


Note.—This article is based on a talk made by the Administrator of the Soil Conservation Service to the Northeastern Branch of the American Society of Agronomy, June 1956.

of Productive land

and is being diverted each year to such highways, airports, factories, and other. The trend toward urbanization presents and will become of greater and greater the future.

Census figures show that virtually all of the increase in the country's civilian population from 1950 to 1955 was in the metropolitan areas. Significantly, the rate of growth was seven times as rapid in the outlying parts of those metropolitan areas as it was in the central parts of those cities. Still more significant is the fact that growth in the outlying parts of the metropolitan areas was greatest in the territory classified as rural in 1950.

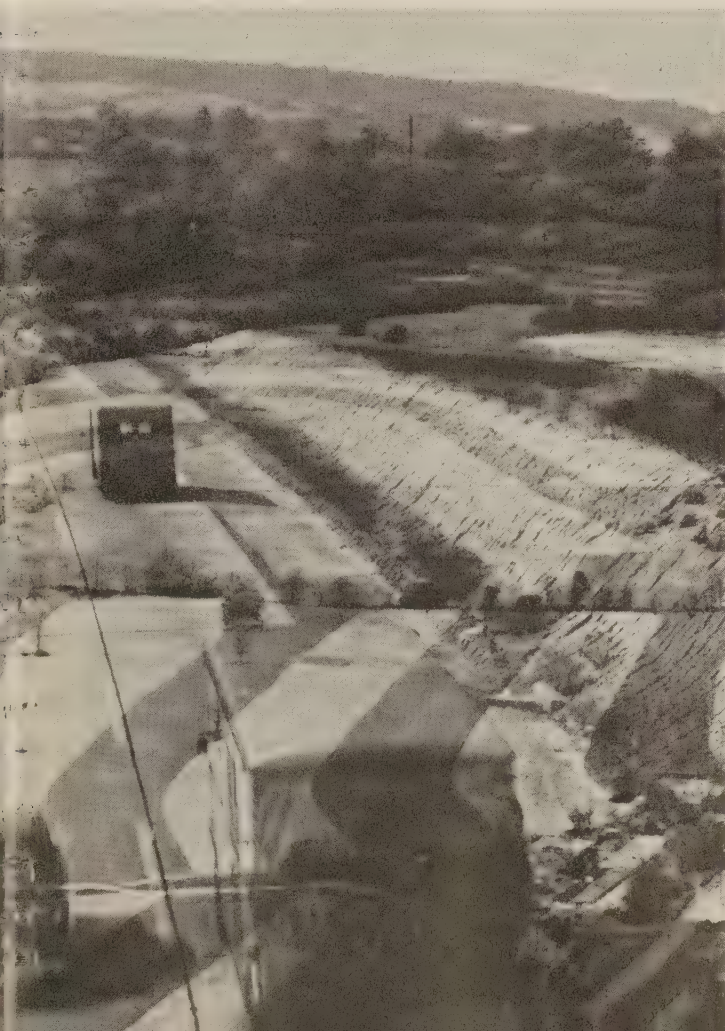


The question is whether we can afford to go on considering our productive agricultural acreages as expendable, or whether we can take steps to minimize the permanent conversion of our better farmlands to urban and other non-agricultural uses.

It is a problem of common concern to agricultural scientists and city planners. It is a problem that demands increasing attention from individual landowners and their local and State governments. It is a problem for the research, educational, and technical brains of the Nation.

We in the Soil Conservation Service frequently have come squarely up against this matter of agricultural land use dislocation. Several years ago, for instance, an entire soil conservation district near Phoenix, Ariz., had to be disbanded because its farmland was swallowed up for other uses. Today, in places like the South Camden area in New Jersey, the spread of suburban environs is shifting the workload of SCS technicians more and more from conventional conservation farm planning and application assistance.

Recognizing the need for measuring the urbanization and related problems of agricultural land conversion, the Service last year made a State-by-State study on the conversion of cultivable land to other uses. The study showed that every year more than 1 million acres of cultivable land in the United States is going into such uses as urban subdivisions, industrial sites, defense establishments, highways, and airports. During the last 15 years, the study indicates that approximately 17 million acres of our flattest and most fertile farmlands, that is, in land capability classes I to IV, have been converted to such nonagricultural use.



That represents almost 3 percent of all land suitable for cultivation in the United States. If these withdrawals continue for another 15 years at the present rate—and the trend is slightly upward—a total of about 100 million acres of land that once was suitable for cultivation will have been converted to nonagricultural use, including about 80 million acres that have now been so converted.

More than 2 million acres of cultivable land have been converted to nonagricultural uses in the last 15 years in the northeastern States of Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, West Virginia, Maryland, and Virginia. Of the land suitable for cultivation in these States, from 10 to 25 percent has gone into city developments and suburbs, factories, airports, highways, and other nonagricultural use.

About one-fourth of the cultivable land in New York State, for example, has been removed from cultivation. The trend continues upward at a fast rate in the Northeast generally, though the rate of conversion for New England has been lower than for some other section of the country, probably because of comparatively slower population gain in recent years in that area of long-standing high population density.

It is when we examine specific local situations that what is happening is brought home to us. In making the agricultural land withdrawal study, we found in Montgomery County, Md.,

that a total of more than 37,000 acres of Class I to IV land had been converted to other than agricultural use in the last 15 years. Better than 12,000 acres of it was for public development and 16,000 acres for private development. That represents 14 percent of the county's 268,700 acres of cultivable land.

In Baltimore County, Md., with its 126,000 acres of Class I to IV land, the 22,000 acres withdrawn for public and private developments in the past 10 years represents more than 17 percent of land suitable for cultivation converted to nonagricultural use in that period. That is to say nothing of the more than 75,000 acres of such land estimated to have been shifted over previously in this county.

Another drain on former farmland is the superhighways like the Pennsylvania and Ohio turnpikes or the New York Thruway. These superhighways require 50 to 60 acres of land to the mile, and ordinary first-class highways require 25 acres or more. When we stop to think of the many thousands of miles of these highways built in recent years, of the highways under construction or planned, we begin to get an idea of the extent and complications of the land conversion problem. The projected new interstate highway system alone calls for 42,000 miles of modern highway construction.

The growing competition for good land, between farmers and special users, parallels the increasing competition for available water supplies, among agricultural, urban, industrial,



A suburban development on class I and II land while less valuable land around it remains undeveloped.

transportation, recreational, and other users. With our population already at the 168-million mark and headed for upward of 200 million within the next two decades, we obviously are going to continue to need more building space, highways, and so on. That poses an especially pressing problem in the Northeast, where nearly a third of the Nation's population already is centered. But the problem is not confined to the Northeast. The Southeast, the Midwest, the Pacific Coast, and even the broad stretches of Texas and other Southwestern States are also affected.

As you know, home construction, industrial, and other users look first for the best land sites—usually good, arable land. They do so because level land involves lower construction costs, less troublesome drainage and water disposal problems, easier highway grades, room for long airport runways, and so on. Modern stores and factory plants require much larger land areas than they used to, and more and more land goes into automobile parking areas and the like.

Urbanization and industrialization of agricultural land sets up a chain reaction that extends right down to the field of interest of every one of us. As land use changes from agricultural to residential or commercial, tax valuation rises on all land within the affected area. Those continuing to farm there are trapped in an urban economy with unaccustomed assessments for community improvements and services, rising taxes and other costs, and consequently lower net returns on their farming operations.

As urbanization extends farther into agricultural areas, the pressures upon local and State taxing units increase for more schools, sewers, and other necessary community facilities and improvements. The tendency then is to increase real estate taxes on the remaining agricultural land, thus intensifying the problem for farmers.

As the pressure increases for putting the remaining farmland into building lots or other nonagricultural uses, farmers hesitate to establish conservation farm plans or to put in needed improvements such as drainage or irrigation systems. They have little incentive to follow good liming, fertilizing, and other programs because such practices won't add to the price of the land for nonagricultural uses. Also,



The owner of the farm in the foreground recently completed a drainage ditch, but now regrets the expense as he sees his neighbor's farm across the road being developed as an urban area.

as the better cultivable land shifts to other uses, and as food demands rise at local urban market points, food production inevitably shifts more and more to lands that are less suitable for cultivation.

The fact we have to recognize is that the farmers in these situations no longer can run their farms the way they used to operate them. And that patently means that we, as soil conservationists, can't go to the farmers in such changing land use areas with the kind of agricultural programs that are suited for the regular, undisturbed farming areas.

But we must remember this: The fact that a substantial percentage of the good farmland in urbanized areas goes under roof, concrete, or asphalt does not mean there no longer are soil and water conservation, agronomic, forestry, or agricultural engineering problems to be dealt with in the watersheds involved. If anything, these problems are increased in this process of changing the hydrologic pattern of whole watersheds, or parts of watersheds.

In some places of urban expansion, up to a third of an area's land surface has been taken out of farmland, pasture, or woods and covered with paving, houses, and other surfaces that



This former walnut orchard was valued at more than \$1,000 per acre as agricultural land, but it is valued still higher as suburban homesites.

produce almost 100 percent water runoff with a high flood potential. In other places, stream courses have been changed or their channels restricted for residential or industrial purposes. Only complete conservation treatment of the watersheds above those points can relieve the continuing flood threats thus created. In the meantime, more intensive and efficient management and use of remaining agricultural lands in urban areas is called for by the increased pressure of local markets, particularly for vegetables, dairy, and poultry products.

Another fact we need to face is that we don't yet have agronomic and other technical programs adequately tailored to meet the unique needs of areas heavily checkerboarded with agricultural and urban land use. We are lacking particularly in full data needed in developing and carrying out "urbanized agriculture" assistance programs with maximum benefit to landowners, watersheds, and communities, and with maximum utilization of our technical manpower and other facilities.

That is one of the reasons the Soil Conservation Service made the agricultural land-withdrawal study. Further essential information bearing on this part of the country's increasingly complex trend in land and water use will result from a recently authorized national inventory of soil and water conservation needs.

This inventory will be made and kept current by the Department with the cooperation of State and local agencies.

Much research also needs to be done along agronomic lines and in engineering and other fields to find further answers to the productive management of lands in urbanized areas, both agricultural and nonagricultural, and dealing with accelerated floodwater runoff. One side of the problem, for example, is that of developing means that will enable owners of former farmland tracts, who decide to hold onto them for suburban development instead of farming them, to maintain economical protective cover on such land.

The Soil Conservation Service in meeting its responsibility for land treatment is trying to find plants that the research people ordinarily pass over because of their lack of farm utility. As a result of such activity during the last 20 years in nurseries and plant materials centers, land users today have available some 60 or 70 adapted conservation plants that they did not have before; and many more undoubtedly will be added to this "conservation plant bank."

One of the most dependable "tools" we have available to work with is the soil survey. On the basis of the soil survey land capability determinations are becoming more widely available as a guide to the various interests, governmental or private, that may be or should be working to protect our good farmlands for agricultural use.

Although we don't have all the answers to the drain on agricultural land through urbaniza-



Ordinary modern highways consume 25 to 30 acres of land per mile; many of the four lane superhighways consume twice that much.

tion, it clearly is possible to use less productive lands for factories, suburban home sites, and so on. Also, it is feasible in many cases to select routes for highways so as to bypass the best agricultural lands.

By using soil survey and land use capability information and other data as they are accumulated, we can find a surprising amount of land not suitable for crops that is available for many of these nonagricultural purposes.

Policies that will make it possible for our economy to expand without unnecessary encroachment upon our productive croplands need to be developed. In some localities, attention has been given to zoning ordinances as a device to help guide more orderly development of industrial and urban expansion.



Linwood L. Lee of the Soil Conservation Service looks at a "For Sale" sign in a luscious alfalfa field growing on Class I farmland.

We must realize, of course, that we can't hope to deal with each and every individual involved in urban developments. But we can deal with the municipal council, town, or other units concerned. That is the way the matter has to be approached essentially, because individual small suburban property owners can't solve these land and water problems alone anyway. Big industry, military, highway, recreational, and other interests, on the other hand, can do a great deal to meet some of these problems as independent problem units, if they are given the incentive for doing it and can obtain the necessary technical information or assistance.

An important job of education is involved—not only of individual farmland owners and operators in urbanized localities, but of communities themselves.

Fortunately, there has been a rapidly growing community approach to soil and water and other resources conservation problems in recent years. It is particularly evident in soil conservation districts in dealing with basic soil and water problems, and in community watershed developments on a local-State-Federal partnership basis through the Upstream Watershed Protection and Flood Prevention Act.

Such available community conservation machinery can help cope effectively with important problems like urbanization of agricultural lands. How effectively depends in a large measure upon the local understanding and desire and the initiative taken by State governments and by affected individuals and communities.

It also depends in no small measure upon the continued and ever closer teamwork of all agencies and interests—government and private; local, State, and Federal; research, educational, technical, and financial. Whether we are soil conservationists or agronomists, engineers or foresters, soil scientists or biologists, we have a growing opportunity and responsibility to devote our best talents to the urbanization and other resource conservation and utilization problems that challenge us.

BETTER DAYS THROUGH BETTER WAYS.—The Future Farmers of America are following their creed of "Better days through better ways," in South Carolina by participating in land judging contests.

More than 7,000 boys received training in soil judging and land use last year. Of this number, 26 teams of 4 boys each competed in the State finals held in March. All teams had taken part in federation eliminations. The team from Bamberg High School, coached by W. C. Huiet, won first place. Another team from this same school won first place in the State in 1955 and won second place in the national contest.

The training of students was done mainly by vocational agriculture instructors. Sponsors for the contest were: Carolina Power and Light Company, Champion Paper and Fiber Company, South Carolina Association of Soil Conservation District Supervisors, Union Bag and Paper Corporation, West Virginia Pulp and Paper Company, and International Paper Company.

Soil Conservation Service technicians helped with training schools for all teachers of agriculture in South Carolina to prepare them to train their students.

—E. N. MILLER, JR.

JO ANN KNOWS ABOUT TREES

In McCurtain County, Okla., school forests provide outdoor classrooms for conservation experience, funds for special projects, and community inspiration.

By CHARLES P. BURKE

“THE southern forest impressively demonstrates that trees are a renewable crop,” says Jo Ann Watson, an eighth grader at Beachton School in northern McCurtain County, Okla. The statement is quoted from her prize-winning paper in a recent forestry theme contest. What does Jo Ann know about southern forests? What does she know about tree crops? Where did her interest in forestry get its start?

In McCurtain County three schools, at Beachton, Brushy Ridge, and Smithville, have their own school forests. Beachton and Brushy Ridge are small rural grade schools. A consolidated high school operates at Smithville. All three are in the heart of the southeastern Oklahoma pine country.

First requests for the initiation of school forest projects were made to the Little River Soil Conservation District in 1954. Timberland owners in northern McCurtain County submitted the idea to the district supervisors and offered forest tracts for the school forests. The project was presented to the respective school boards and teachers through the supervisors. The response was immediate, enthusiastic, and favorable.

J. D. Bates is a soil conservation district co-operator and a large forest landowner in Oklahoma, Arkansas, and Louisiana. He furnished 40-acre woodland tracts to the Beachton and Brushy Ridge schools. A 10-year renewable contract was signed as a basis for school use of the areas. Another cooperator, the timber growing firm of McKee, Story, and Wilson made 80 acres available to Smithville High School on a similar basis. Each landowner-school lease

called for cooperative agreements between the schools and the Little River District. Forest management plans, suitable for school forest operation, were also required. Before the end of 1954 all agreements and conservation plans were completed and in effect.

All three school forests were dedicated with appropriate ceremonies in January 1955. Students and their teachers, school patrons, school boards, the landowners who made the tracts available, Soil Conservation Service technicians, representatives of forestry industry, and district supervisors were present at the dedications. The Little River Soil Conservation District furnished attractive marble markers for each school forest. These were put in place during the dedications. The Beachton, Brushy Ridge, and Smithville schools also became cooperators with the Little River Soil Conservation District.

The next big event was the 1955 school forest harvest. Each school scheduled a special day on which to cut the products. Each forest had been divided into annual cutting compartments with just one compartment cut each year. Net incomes from the cuts the first year were from \$35 to \$105. Labor was donated by the pupils, teachers, patrons, and school board members.

The trees to be cut had previously been designated with tree marking paint. Before cutting began, all present were instructed on the reasons for marking. At Smithville High School, senior class boys did most of the marking under



Jo Ann Watson (left) and Rachel Goings of Beachton school peeling posts as a part of the school forest harvest.

Note.—The author is woodland conservationist, Soil Conservation Service, Hugo, Okla.

the direction of the SCS woodland conservationist and conservation aid. The products selectively harvested consisted of pine posts and pulpwood. Cull hardwoods or weed trees were eliminated by axe girdling, or by use of a tree injector. The tree injector is a special tool recently invented for injecting tree killing chemicals beneath the bark. The school forests were pioneers in using this tool for forest improvement in McCurtain County. Now, more than a dozen of the injectors are in operation.

In addition to labor, the local people donated trucks for transporting the products to market. The youngest workers were not more than 8 or 9 years of age, the oldest were about 70 years old. People who do not live in or near the woods might find it hard to believe—most of the post debarking, or peeling, was done by the girls or women. One of the teachers was a near-champion in numbers of posts peeled.

At each school forest harvest, a highly competitive spirit soon developed. Most of the workers, from the largest down to the smallest, gave their best effort.

Money returns from the harvests go to the schools. Last year, at Beachton, the money was used for an educational trip for seventh and eighth graders. Brushy Ridge applied their school forest money on equipment for a new hot lunchroom. At Smithville High School, the senior class each year uses their harvest fund for the annual senior class trip.

Selective cutting in the 1956 compartments also eliminated weed trees. A new method of cull hardwood was used at Smithville, a gasoline-powered girdling machine.

All three schools added pine planting to their projects in 1956. Two thousand pine seedlings were planted on the Smithville school forest. A thousand were planted on each of the other forests.

At Smithville, Harvest Day activities were filmed for WKY-TV presentation. A special chartered bus brought visitors from towns in southern McCurtain County. Adult participation increased greatly and money returns showed an increase.

The school forests are a going concern, dedicated to good conservation and use. The pupils are becoming junior tree farmers. Some of them are sure to grow into adult tree farmers.



Betty Jene Fairless of Brushy Ridge school, another winner in the forestry theme contest also peels her share of posts at the school harvest.

They will remember the conservation lessons learned in their own school forests.

According to Dick Piner, chairman of the Little River district board of supervisors, "With 853,000 acres of woodland in McCurtain County needing continual protection and management, these school children will help to lead the way."

Yes, Jo Ann Watson from Beachton, knows about trees as a crop. She can speak with authority. Other youngsters, and some oldsters, at Beachton, at Brushy Ridge, and at Smithville, are also learning about wood as another farm crop—how to grow and protect it—harvest it—and benefit from it.

RANCH TRAINING PROGRAM.—Texas Christian University starts a 9-month course in ranch training this fall. Their catalog says: "This is not a textbook course. It is a field study, through observation of and participation in the activities of many outstanding ranches of the Southwest."

Enrollment is limited to 15 students during the first year. Those under 21 years of age must be high school graduates; those over 21 will be accepted regardless of previous formal education.

Subjects studied will include: breeding and feeding livestock, grassland management, livestock marketing, soil, water, and wildlife conservation, and general ranch management. The director of the ranch training program is Arthur H. Courtade, a former conservationist of the Soil Conservation Service.

Don't Burn Stubble

By HUGH F. EAMES

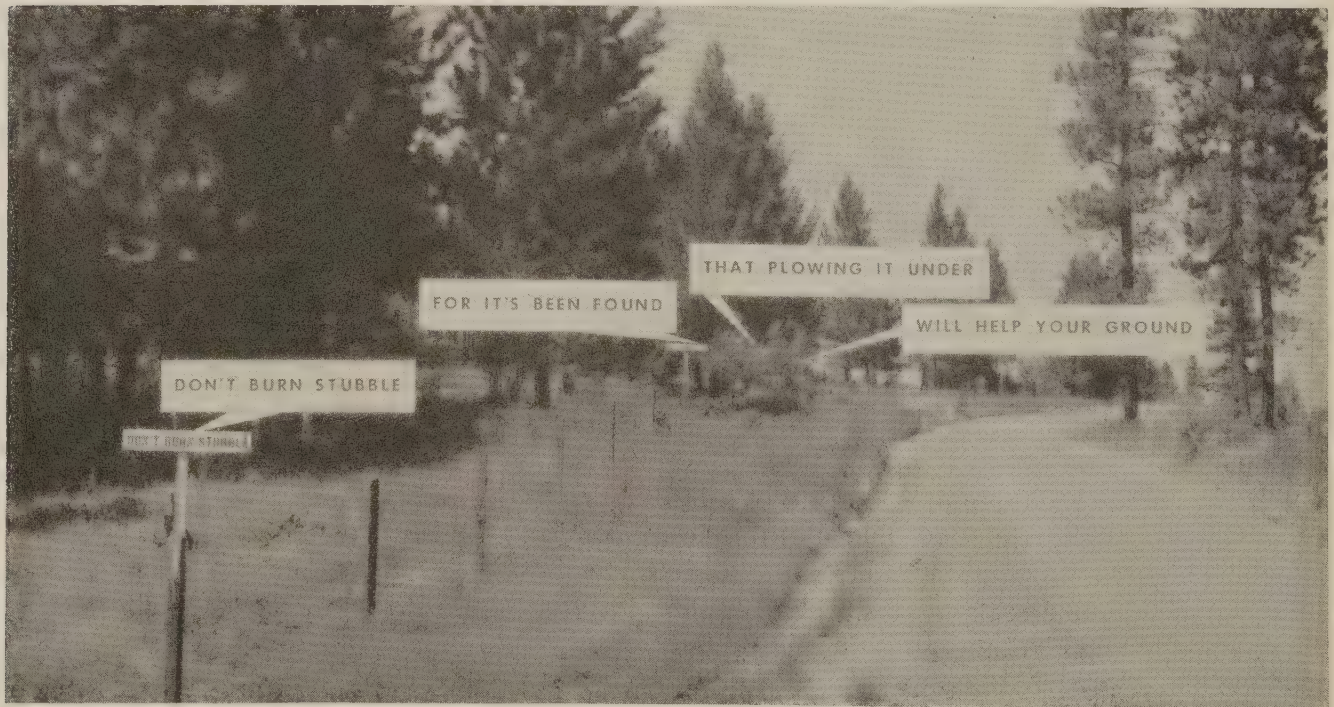
FOR many years stubble-burning had been a serious problem in the Lewis Soil Conservation District and other grain growing areas in Idaho. In 1945 about 45 percent of Lewis County grain and barley stubble was burned. When the soil conservation district started its program it made war on stubble-burning one of its top priority projects. The efforts were effective: burning was steadily reduced until in 1953 fire consumed only about 11 percent of the annual production of stubble and straw.

Last year the district supervisors decided that 11 percent was still too much; so they made studies for new methods that would pare it down. Using the popular old roadside shaving sign idea, they mapped out a campaign.

Chairman Don Baldus got the Riverside Lumber Company to donate enough lumber to build the road signs. One rainy day, Baldus and Soil

Conservation Service technicians Ken Riersgard and Wayne Shaeffer, made the signs and painted slogans. Shaeffer did the lettering on 4 sets of 5 signs for each supervisor. Five men—Baldus, Wynne Henderson, Andy Goin, Joy Woodruff, and Daland Baker—agreed to post the hundred signs along the county roads and main highways throughout the district and take them down after fall plowing season.

When August came and grain harvest started the first signs were placed along the roadsides. Along with this a school poster contest and newspaper campaign were carried out. The publishing of 5 different posters was started in 2 county newspapers, a different one appearing for 5 successive weeks. The district paid for newspaper cuts, technicians wrote text to go with each, and newspapers took care of the rest of the job. As a third step, copies of



Roadside jingles in the Lewis (Idaho) Soil Conservation District.

jingles and other broadcasting material went to radio stations.

The schedule was set up so that one step would be started in each of the last 3 weeks of August. In this way, farmers were exposed to the material, in one form or another, from before grain harvesting until after fall plowing, when the stubble-burning period ended. Progressively, series of roadside signs told stories like this: Don't Burn Stubble, For It's been Found, That Plowing It Under, Will Help Your Ground. Others were such as these:

Don't burn straw
Like Grandpa did
Help save the soil
For your own Grand Kid

Chop it or bust it
Or let it stand.
But don't burn your stubble
For the good of your land.

The *Nez Perce Herald* and *Lewis County Register*, weekly newspapers published by Ernest Conger, swung the newspaper end of the campaign, while radio stations KORT at Grangeville, KRLC at Lewiston, KRPL at Moscow, and KWSC carried frequent short announcements.

Altogether, the campaign cost the Lewis Soil Conservation District \$35, only what it paid out for cuts and other materials. The SCS technician put in 68 man-hours of work. Miracles were not expected, but when the season was over and district supervisors measured effects, they found that stubble-burning had been reduced to about 4 percent of the wheat and barley acreage. This is about a third of what it was 2 years earlier and a twelfth of what it was in 1944.

LIVING GRASS EXHIBIT.—A feature of the State Fair Park in Oklahoma City, Okla., is a living exhibit of 55 species of grasses, forbs, and legumes native to that State. The exhibit is sponsored and maintained by state chapters of the Soil Conservation Society of America, the Oklahoma Seedmen's Association, and the Oklahoma State Fair and Exposition. It is frequently used as an outdoor laboratory by FFA and 4-H groups for identification of useful native plants. Several groups of foreign students have also studied and admired the exhibit.

Grass, Cattle, and Trees in North Dakota

By CURTIS L. LOUCKS

GRIMSI GOODMAN and his sons plan for their 2,150-acre farm to provide gainful employment through the winter as well as other seasons of the year. They help gain this objective by properly using grass, and by planting field windbreaks to hold snow on the fields and to protect them from wind erosion.

The Goodman farm is located north of Milton, in northeastern North Dakota, just 20 miles south of the Canadian border. The farm is a third generation enterprise. Grimsi took over the ownership and operation of this unit when it was a 320-acre farm. It had been his father's homestead. Later purchases by him and his sons enlarged the farm to its present size.

Note.—The author is work unit conservationist, Soil Conservation Service, Langdon, N. Dak.



Grimsi Goodman.

A great deal of work was needed to bring this farm to its present level of production. Pastures had to be improved, water supplies for livestock had to be developed, waterways in a number of fields required leveling and seeding to grass. Some clearing of rocks and brush on cropland was necessary. It was all accomplished without neglect to the soil. The conservation program consisted of proper land use, establishment of good conservation practices, and the use of commercial fertilizers.

After the mechanical practices were completed on the cropland, a cropping sequence with grass and legume rotations was developed.

There is 1,600 acres of tillable land on the Goodman farm, but the striking difference between it and the average farm is the small acreage of land fallowed each year. Less than 10 percent is fallowed, as compared to 30 percent or more for the average farm of the county. As a general rule summer-fallow is done only on cropland that has become heavily infested with quackgrass.

The sequence of crops is potatoes, 2 years of wheat, barley, oats, and flax. All crop residues are worked back into the soil and no burning of stubble is permitted. After this series of crops are produced a grass-legume mixture, usually alfalfa and brome grass, is planted and used for hay or pasture. After 3 years, this mixture is plowed under and the crop sequence mentioned above is again used. This system per-

mits the alfalfa and brome to remain on the land for approximately one-third of the time.

A major phase of the soil conservation program is establishment of 3-row field windbreaks at intervals of a quarter of a mile. These are planted crosswise to the prevailing winds. Three varieties of trees are used, consisting of 1 row each of Caragana, golden willow, and green ash. Rows are spaced 13 feet apart so they can be cultivated with regular farm machinery. These trees also serve to keep drifting snow off the roads as well as to protect cropland from wind erosion. A small number of native plum trees are interspersed in the plantings to provide food for wildlife.

By the spring of 1956, 4½ miles of windbreaks were established. Generally, at least half a mile is planted each year and will be continued until the belts are all planted. The local soil conservation district plants the windbreaks under the supervision of Soil Conservation Service personnel assisting the district and the farmer.

Before the native wooded pastures could be economically used, they had to be renovated. First, most of the scrub oak and elm trees were removed with a bulldozer, the largest trees being left for shade. Then a heavy brush disk was used to eradicate the remaining brush. After this operation was completed it left the surface broken so as to provide a seedbed suitable for seeding to a grass-legume mixture.



Shorthorn cattle on Goodman farm with farmstead in the background.

Again alfalfa was included in the mixture with brome grass. This practice could only be performed on the bottoms of the coulees and on some of the gentler slopes. The erosion hazard was too great to warrant brush removal on the steeper coulee banks. The brush that remains not only protects the slopes from erosion, but it makes a good wildlife habitat. In all, 110 acres were improved in this manner. It resulted in increasing the production of the pasture from 8 acres per animal unit to 3 acres per animal unit for the grazing season.

In order to obtain the maximum use of these pastures a water supply had to be developed for each pasture. It was done by the use of both dams and dugouts. Coulees were dammed to provide 2 of the stock water ponds, and reservoirs were dug where seeps or runoff would keep them filled, to provide the other 3 watering places.

Grassland not utilized for pasture is cut for hay or grass-silage and stored near 1 of the 2 main feed lots. One of the feed lots is located in the bottom of a large coulee near the farmstead. It is arranged so that 1 man can feed 125 head of cattle in less than 1 hour. The lot features an automatic watering device, a large hay storage shed complete with dryer, and a conveniently located trench silo. It is well protected from wind and drifting snow from all directions and is commonly referred to as one of the most ideally developed feed lots in northeastern North Dakota. The purebred herd of shorthorn cows is wintered in this lot and the 120 calves are held in the feed lot at the farmstead. After the cows are moved out to pasture with their new calves, the yearlings are put into the coulee feed lot to be finished for market later in the summer.

The farmstead shows just as much improvement as the rest of the farm. One farmstead windbreak was planted several years ago and another was planted in May 1956. A spacious lawn is well kept and beautified with ornamental trees, shrubs, and flowers. The road into the farm is kept surfaced with shale and gravel so that it can be traveled at any time.

A grain dryer is incorporated with the farm grain storage elevator. Grain can be threshed with moisture contents far in excess of that normally considered safe for storage, and it is then dried to a safe moisture content. This de-

vice helps the Goodmans to grow high quality certified seed grain.

Grimsi Goodman is 1 of the original 3 members appointed in 1947 to serve as a supervisor of the East Cavalier Soil Conservation District. He still holds his position as a supervisor and for the past year has served as chairman of the board of supervisors. His interest in soil conservation demands a great deal of his time. He attends district supervisors meetings regularly, has attended all of the area and state soil conservation district supervisors meetings, as well as several national district supervisors conventions. He has also devoted much time to the Tongue River Watershed Protection Project that the East Cavalier Soil Conservation District supervisors is cosponsoring.

One son is in the armed service, and the other two are at home. Glen, the eldest, is married and lives in his own house on the same farmstead. Grimsi and his sons are partners and share in the business of running the farm, so it is under management at all times even though one or more of them may be away.

This farm was picked as 1 of the 3 winning farms in the Soil Conservation Achievement Contest, sponsored by the Greater North Dakota Association, and is often chosen as the farm on which judging contests and workouts for 4-H Clubs are held.

SELECTIVE CUTTING.—Members of the County Line Missionary Baptist Church near Nashville, Ark., have learned how to make their 32-acre pine woodland pay off indefinitely. In learning, they have made a convincing case for selective cutting of woodland. In 1939, when the first cut was made, the area was divided into two 16-acre plots. One of these plots was clear cut, the other was selectively cut according to suggestions made by the Soil Conservation Service.

The history of the two plots since 1939 tells the story. In 1945 the selectively cut area yielded 20,000 board feet of logs that netted the church \$400, and in 1950 a cut of 55,000 board feet netted \$3,052. An estimated 60,000 board feet of merchantable timber worth around \$3,500 remains on the land. The clear cut tract has not yielded any merchantable timber since 1939 and it will be several years before this tract is in production; it now has approximately 10,000 board feet of merchantable timber worth \$500.

The 16-acre tract selectively cut has produced at the rate of \$14.50 per acre per year for the past 16 years. The 16-acre clear cut tract has produced at the rate of \$2 per acre per year during the same period.

OFFICIAL BUSINESS

HEAVY EQUIPMENT DEMONSTRATIONS.—Heavy contractor-sized equipment is being used on Wisconsin farms in a series of demonstrations on land forming, sub-soiling, and deep plowing, according to Al Wojta, University of Wisconsin soils specialist. Equipment is made up of out-sized plows, disks, land levelers, bulldozers, and subsoilers that cut the soil anywhere from 12 to 18 inches deep.

The project has been set up to study effect of the deep tillage and to determine value of mixing fertilizers at deeper than normal plow depths. Equipment is on loan from contractors. The Soil Conservation Service is cooperating in the trials.

Wojta points out that farmers in the red clay area of eastern Wisconsin may save \$100 an acre in the cost of tilling, by using the deep plow system to improve drainage. He also feels it may be possible to get cheaper forage production by extending the life of forage seedings with deep tillage.

CAN WE SAVE OUR ORGANIC SOILS?

(Continued from page 59)

Heretofore, research efforts have been directed primarily toward the development of better water control techniques. Such work has been, and will continue to be, of immense benefit in minimizing subsidence; but at best, precise control of water levels is only a palliative.

To augment these studies, basic research designed to get at the fundamental causes of the destruction of organic soils as influenced by different environmental conditions and treatments should be stepped up. It may be that the soil microbiologists can come to the aid of the research engineers with a better understanding of the micropopulation of the soil and suggest possible means of regulating them to a point where they will not consume the organic material faster than is necessary for making needed nitrogen available for optimum plant growth.

MORE BUNNIES FOR BEAGLES.—C. L. Holliday of Grundy County, Tenn., owns a pack of beagles that he likes to hear run. His problem was how to have good rabbit races in the time he could spare from his mortuary business. This meant he couldn't afford to waste time looking for bunnies. So Holliday called on E. L. Holder, Soil Conservation Service technician with the Grundy Soil Conservation District, and told him what he had in mind. Holder was interested because of the land cover angle. Whether the cover is used to grow beef or bunnies doesn't matter so much to him as long as it protects the land. So Holliday and Holder set out to plan a conservation program for Holliday's 26-acre tract.

In less than a year, Holliday had seeded 4 acres to ladino clover and orchardgrass, which he limed and fertilized; seeded 2 acres of rough, eroded land to sericea; planted three small patches of loblolly pine; set out multiflora rose along his line fence; planted two bush lespedeza borders next to woods; and protected the entire area from forest fires.

He then asked neighbors not to shoot the rabbits. He explained to them that he was doing this work to get bunnies for beagles, not for the pot.

Rabbits are already showing up on the place.

—C. M. HENNINGER AND E. L. HOLDER

SOIL STEWARDSHIP.—The Reverend Richard K. Morris, pastor of the Baptist Church in Knoxville, Pa., is one of the outstanding conservationists in the Tioga County Soil Conservation District. He regularly attends and takes an active part in meetings of the soil conservation district and the Cowanesque Watershed Association. He preaches sermons on conservation and emphasizes the moral and spiritual as well as the material benefits of conservation. He makes radio talks about conservation and outlines tours on which members of his congregation may see the results of erosion and the benefits of conservation.

The Tioga district directors frequently call on Pastor Morris to assist in their educational program. He also acts as an adviser and salesman for some of the retiring farmers of his congregation who wish to sell their farms. He states: "I want to be sure that the buyers are conservation farmers."

—WILBUR THOMAS



NOVEMBER 1956

SOIL CONSERVATION

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION.

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U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

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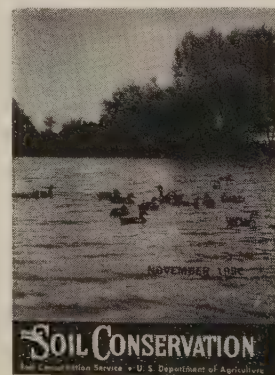
OUR SOIL ★ OUR STRENGTH

THE FIRST PATENT.—It was 166 years ago that the first U. S. patent was granted to Samuel Hopkins for "a new apparatus and process" in making potash from wood. It was signed by George Washington.

In 1790 in Vermont, where Hopkins developed his furnace process, the forests were being cut and burned to get them out of the way so the settlers could raise food for their families. Trees were looked upon as obstacles to a family's chances of making a living, and as cover for Indians and other potential enemies.

As standing timber, the trees had little value except those that could be used on the homesteads for cabins, barns, and fences. As potash, they had cash value, not only because soap-makers and wool-processors needed potash and would pay for it but also because it was relatively light in weight and the buyers usually would pay the cost of shipping. As a source of cash revenue, the trees converted to potash were a handy aid to many farm families and vital to the progress of the young nation.

Editors are invited to reprint material originating in this magazine.



FRONT COVER—Wild ducks on a Wisconsin pond. Sound soil and water conservation practices help wildlife.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Wildlife Habitat Improved

Soil and water conservation programs on farms and ranches of the United States have greatly improved wildlife habitat in most instances, and thus have helped increase most species of beneficial wildlife.

By EDWARD H. GRAHAM

FARMERS and ranchers of the United States have done more for wildlife during the past 20 years than has ever been done before on private lands in any country.

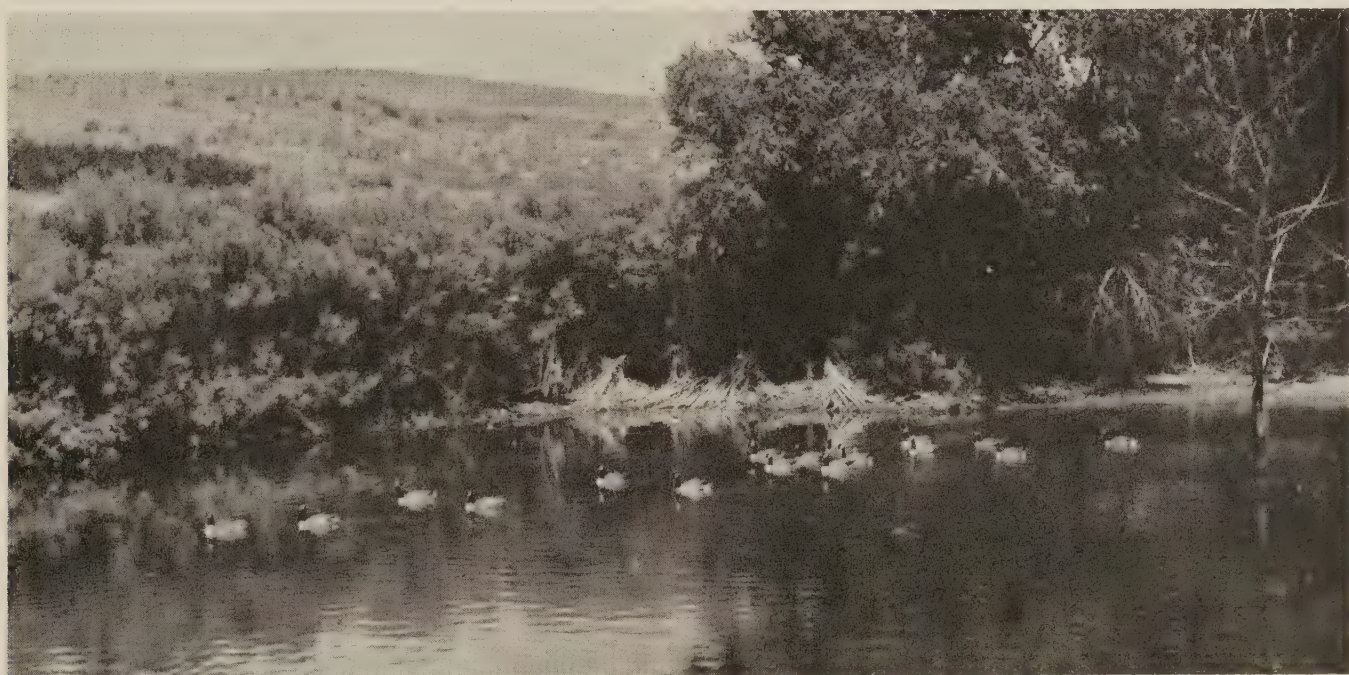
Habitat improvement is the key to wildlife management. That is true on private as well as on public land. And, because most of the hunting in the United States is done on private land, landowners and operators become pivotal figures in wildlife management.

It is not enough, however, to say that farm-

ers and ranchers are key figures. They become wildlife conservationists only when they do something about improving wildlife habitat. But in recent years farmers and ranchers in this country have shown a great deal of interest in wildlife. Many of them have modified their operations to improve their lands as wildlife habitat. Improvement of wildlife conditions, in fact, has come to be an integral part of soil and water conservation programs on thousands of farms and ranches, hand-fitted to the individual conditions on each farm or ranch.

In doing this, our land users have pointed to the objective that must be reached if we are to have the wildlife we want in America.

Note.—The author is director, plant technology division, Soil Conservation Service. This article is adapted from a paper presented by him before the International Union for Conservation at Edinburgh, Scotland, June 1956.



Canadian geese on a spring fed pond on the Banning-Lewis Ranch near Colorado Springs, Colo.

We must learn how to manage the land so that we can increase the production of wildlife, both on lands devoted exclusively to wildlife and on those lands we manage primarily for other purposes.

Even the areas originally set aside as wildlife refuges have themselves required management. For one reason or another nature proved inadequate. In some instances the species to be protected were unable to persist in the changed environment that developed after the refuge area was established. Hunting pressure or other pressures, such as the demands for livestock grazing, in some cases have been sufficient to require the reserve managers to permit such use, with resulting changes in wildlife environment.

Management measures have been necessary especially in refuges for migratory waterfowl, where the construction of water impoundments and the growing of food plants have been extensively undertaken. One of the real problems in the administration of a national migratory waterfowl refuge system in the United States, comprising some 3 million acres, is the development of land and water management practices that will maintain or increase the populations of waterfowl on the refuge areas.

In the United States as in other parts of the world, the use of land for agricultural development has modified much waterfowl habitat.



Mallard ducks rearing young in a small slough on a New York farm.



Muskrat in an Illinois farm pond.

All reasonable efforts should be made to preserve the remaining waterfowl nesting and wintering ranges in North America. But much of the habitat that existed before settlement will inevitably disappear before the constant pressure of human expansion. Multiple-lane turnpikes, airports, widespread urbanization, extensive industrialization, and other demands for land take more than 1 million acres every year in the United States. Some of this is wet land. The future would indeed be dark for waterfowl in North America if no alternative or substitute for natural habitat were possible. But an alternative does exist—a substitute with great potential that is already realized in part.

The alternative is the conscious creation of ponds and other manmade bodies of water in coordinated soil and water conservation programs and their intentional management for waterfowl. As an integral part of a long-range plan of good land use, an individual farmer or rancher adjusts his operations according to the determined capabilities of his land for production—whether for cultivated crops, livestock, wood, or wildlife. His crop fields, pastures, woodlands, and wildlife areas are delineated on a map and their management related in a long-term conservation plan. As a part of such a plan water areas may be built for stock water or other practical purposes and in some cases for fishponds. They are suitable for migratory waterfowl and other wildlife, create a pleasant

recreational area on the farm, and add to the esthetic value of the landscape.

As part of better land use programs, farmers and ranchers in the United States have constructed nearly 2 million ponds in the past 20 years. The ponds vary in surface area from a portion of an acre to several acres. In many parts of the country they have literally changed the face of the landscape. There are now water areas where none existed before. Whether these manmade areas can take the place of natural habitats for waterfowl is often debated. There is no doubt that we are learning a great deal about making them suitable for waterfowl. Furthermore, they have the advantage of being relatively permanent parts of the established landscape because the landowner wants them, and in many instances he wishes to manage them for waterfowl.

In the prairie region of the north-central United States, farmers have drained a number of small natural ponds that provided waterfowl habitat. Such drainage has taken place, for example, in the eastern part of South Dakota, where the use of the land is largely for farming. In the western part of the State, which is natural grassland now used mainly for grazing livestock, the creation of farm ponds has done much to compensate for the loss of natural ponds in the eastern part of the State. In western South Dakota, where nature had provided few natural water areas, there are now more than 40,000 manmade impoundments in 39,000 square miles. Investigators of this newly created environment have concluded that such impoundments are supporting a new breeding population of ducks—a population that in 1950 contained nearly one-fourth of the ducks in the State. The impoundments were constructed primarily to provide water for cattle as a part of improved range management. In this type of country such ponds often produce several duck broods per pond. The U. S. Fish and Wildlife Service states that in North Dakota such production compares favorably with natural ponds and that such small impoundments are rated of major importance to waterfowl. Similar reports come from other parts of the United States.

In addition to waterfowl, other species of birds as well as fur bearers and other mammals

have been recorded from pond environs. Among the noteworthy results of biological progress in recent years has been the application of techniques for the production of high yields of fish from such farm and ranch ponds. The large majority of ponds constructed as part of soil conservation programs on farms and ranches have been stocked, fertilized, and managed for fish production with yields of from 100 to 250 pounds per acre. Unlike fish farming in Europe and the Far East, American ponds are managed for sustained yield, and do not require annual restocking. A practice new to America is now taking shape in Arkansas ricefields where rice is rotated with fish; these impoundments are also being modified to support migratory waterfowl.



A Missouri gully (above) that was converted into a farm pond (below).



Yet even more significant than the somewhat incidental wildlife value of farm ponds are the efforts farmers are making to create water areas specifically for wildlife habitat. In New York State, on certain upland sites, landowners are impounding shallow water to create small marshes. In 1954, an examination of 235 such marsh areas, averaging 5 acres in size, showed 85 percent to have ducks nesting on them—mallard, wood duck, black duck, and blue-winged teal. Along the coast of South Carolina, farmers who want to encourage waterfowl make shallow impoundments of brackish water 1 to 4 feet deep and a few acres in size. The impoundments make excellent conditions for widgeongrass, *Ruppia maritima*, a prime duck food. Methods of water level control and the planting of other suitable duck food plants make the impoundments capable of supporting 30 or 40 ducks per acre over the winter period, from November to March. These and other methods of creating waterfowl habitat are being developed by private landowners and operators with on-site assistance of SCS technicians as integral parts of the coordinated, long-range conservation plans for their land.

A few other examples will further indicate what is being done for wildlife as a part of

soil and water conservation programs. In the Great Plains it has become popular to plant windbreak or shelterbelt strips of trees to protect farmsteads and crop fields from the open sweep of the winds. They provide a woody element to the environment that was previously lacking. Proper selection of species has increased the wildlife values of the windbreaks. Both deer and tree squirrels are consequently found far out on the plains, miles from where they could formerly have existed. Windbreaks also provide habitat for birds, including ring-necked pheasants, many of which have been saved from death during severe winters in the protective shelter of the trees.

In the Eastern States many farmers are now using closely spaced plantings of *Rosa multiflora* as a permanent living fence. Requiring less maintenance than a conventional fence, a rose hedge adds a note of beauty to the farm landscape. Rabbits, foxes, mockingbirds, cardinals, towhees, indigo buntings, and other species utilize the rose fences. During the past winter in southern New York such hedges sheltered large numbers of robins far out of their normal winter range during an unusually severe season. It is interesting to note that such plantings are an excellent means of en-



Four ponds were constructed on this Iowa farm as a part of the soil and water conservation program.



A shrub border near a farm woods in Maryland that furnishes food and shelter for many kinds of wildlife.

couraging the insectivorous praying mantis, the egg cases of which are a common sight in the hedge fences.

The effect of proper land use on an upland game species has been notably illustrated in an increase of bobwhite quail on farms under soil conservation plans. In Missouri, conservation farming was undertaken on a 2,000-acre tract of small, rundown farms. The conservation practices that were established included pasture management, liming and fertilizing of crop fields, contour cultivation, crop rotations, building of several farm ponds, and the planting of waste areas and fence rows. The area was also stocked with quail. By the establishment of conservation practices any farmer could afford to apply himself, this tract became one of productive agriculture. Furthermore, it produced, after only 4 years of conservation farming, a wintering population of 44 coveys of quail. All this on an area where normal hunting was permitted and where, before conservation farming, quail stocking had been unsuccessful.

In the southeastern United States, planting of *Lespedeza bicolor*, a perennial shrubby legume, has largely replaced annual grains on farmland as food for the bobwhite quail. The seeds of this Asiatic lespedeza have proved to be a favorite quail food and use of the plant

has resulted in an increase of the bobwhite in many areas. Thus the habitat is improved for a particular wild species on normally used agricultural land.

The above examples of the creation of wildlife habitat and increase of wildlife through soil and water conservation programs on private lands could be multiplied many fold. They are not exceptions. They illustrate the most significant development in wildlife management in our time—the improvement of wildlife habitat by those who own and operate the land. This practical accomplishment has depended upon the coordinated approach to the total conservation job, in which the management of wildlife takes its right and proper place.

Habitat management through soil and water conservation promises wildlife its best chance of a permanent and ever better place in this rapidly changing world of ours. And attention to wildlife in our soil and water conservation programs can make the use of our land yield not only the basic requirements of living, but recreational and esthetic values as well.

DISTRICT SCHOLARSHIP.—Two boards of soil conservation district supervisors in Arizona have joined together in recognizing promising young men so that they could give substantial recognition to all-round high school students. They believe there's a great need for outstanding high school graduates to go to college and prepare themselves for the agricultural, scientific, and teaching fields.

The first year for the joint award was 1956. It was made to John Robinette, Stanfield, Ariz., at the Casa Grande High School. Supervisors Rex Anderson of the Stanfield-Maricopa Soil Conservation District and John A. Fearn of the Casa Grande Soil Conservation District made the presentation.

John Robinette was chosen for his all-round activities. He ranked high in scholastic ability, had been a member of F.F.A. for 4 years, and president in his senior year. He was also president of the Boys Federation. He was a member of the student council and an outstanding athlete, being chosen for the all-State football team in his senior year. He participated in track and played on the baseball team. He was also selected as a representative to Boys State, and Student Rotarian.

The scholarship, which amounts to \$250, is to be given each year. The Stanfield-Maricopa District pays \$150 prior to enrollment for the first semester, and the Casa Grande District pays \$100 prior to the start of the second semester.

Robinette plans to enroll at the University of Arizona, Tucson, and major in agriculture.

—RAY W. BATES

A Small Watershed Demonstration

By LOUIS B. EARLE

THE first small watershed demonstration in south central Kansas was held near Rose Hill, Kans., on May 9, 1956 on the farm of Paul Foley, a tractor dealer in Wichita. Foley furnished more than \$125,000 worth of dirt moving equipment for the demonstration and treated all the guests to a beef barbeque in the evening.

Soil Conservation Service technicians of Wichita and El Dorado assisted Foley in planning and directing the demonstration. They had previously helped develop a complete conservation plan for the farm with Foley and had laid out the practices for the demonstration.

The main purpose of the event was to show the land treatment practices many Kansas farmers may carry out on their land, and the benefits of these practices, as farmers participate and cooperate in small watershed programs.

Over 300 persons coming from a 21-county area around Wichita attended. Attending were farmers, city and county commissioners, county agents, members of the steering committees of seven small watersheds in Kansas, members of Agricultural Stabilization and Conservation Committees, SCS technicians, business and professional men, and many farm power contractors.

On Foley's farm a pond had been built prior to the demonstration. The construction of the dam and its similarity to flood detention dams was explained. Stakes, with ribbons of two different colors attached, showed the level of the pond when full and the level of water if the structure had been designed for flood detention purposes.

Benefits of a farm pond were reviewed. For example, the group was told that farm ponds offer a good source of stock water, provide excellent fishing if properly stocked and cared for, and may often provide a good source of irrigation water. Recreation, too, was mentioned.

Land clearing was observed during the day. A hedgerow containing stumps of many dead trees was removed. This old hedge had served its purpose, but was now preventing installation in an efficient manner of waterways and terraces.

Terrace construction was also demonstrated and it was pointed out that terraces serve two principal functions. They reduce erosion by slowing down runoff water, and they hold the water on the land where it falls for more complete absorption into the soil.

Realizing an income in the form of fence posts, fruit, or berries from trees planted in



A pond on the Paul Foley farm that also serves as a flood detention structure.

Note.—The author is work unit conservationist, Soil Conservation Service, Wichita, Kans.



Constructing a broad base terrace as a part of the small watershed demonstration near Rose Hill, Kans.

shelterbelts was discussed. Increased wildlife growth in tree planted areas also was brought out. The group watched a tree planting machine owned by the Sedgwick County Soil Conservation District. It was pointed out that the machine is available on loan to any farmer in the district.

Native pasture renovation and contour furrowing was shown. Contour farming, vegetated waterways, concrete outlet structures, earthen erosion control dams, and land clearing were also shown.

Methods of deeper seedbed preparation were demonstrated for the group. Subsoiling with both integrally mounted and pull-type subsoilers was shown. A heavy offset disk was then used on the soil to illustrate one method of mulch farming.

A seedbed up to 18 inches deep was prepared with a heavy disk plow. It was explained that this implement was being used to break up the hardpan in the soil for improved water infiltration and to mix the topsoil and the subsoil.

In the evening, after the beef barbeque, a discussion was held on how the different soil and water conservation practices demonstrated during the day tied into the small watershed program. L. L. Males, Cheyenne, Okla., banker, landowner, and secretary of the Washita Valley Council, was the principal speaker. His talk

dealt with the small watershed program that has been completed on the Sandstone Creek near Elk City, Okla.

He stated, "Even the largest dams are useless in flood prevention if you don't treat the land above them."

Males showed the group a picture of a farm pond, in an untreated watershed, that only had several small pools of water in it. He pointed out that the pond lacked water, not because there'd been no rain in the watershed above the pond, but because it had silted in.

He said if the land in the watershed had been treated, the pond would still be serving to hold back runoff water, helping to prevent floods. "This same thing will happen to large dams if the land in the watersheds above them is not treated," Males emphasized.

Among the treatments that he said should have been used, were cover cropping, terracing, deeper tillage, and subsoiling. "None of these practices are new to us," he stated. "The SCS has been trying to get us to do them on our land for over 20 years."

"Farmers who don't install land treatment practices on their land are wearing out their machinery, their families, themselves, and their communities by farming in a way that permits erosion to run rampant. Such farming leads to floods. When farmers in a trade area lose

crops from floods, they cut down their spending and everyone suffers as a result.” He added that at the present time, only one nickel of our present Federal dollar spent for flood prevention goes for small watershed work.

He concluded by saying that 20 or so years ago, they didn’t know how to prevent floods. “But today, we know we can do something about flooding. Are we going to let such floods as we’ve all experienced go on year after year?” he asked his listeners.

Did the land treatment demonstration and Males’ talk have an effect on those in attend-

ance? This comment, made to Males by one of the guests, sums up the day’s proceedings pretty well—“I felt that a small watershed program was what we need in our part of the country; now I’m doubly sure it’s what we need.”

That there was interest in small watershed programs in the Wichita and surrounding area was evidenced by the fact that members of the Wichita press, radio and TV stations, and state and regional agricultural and construction magazines were in attendance to report the day’s happenings.

Cooperation in Cimarron County

By ARCHIE P. WELCH

COOPERATION among agricultural agencies in Cimarron County, at the west end of the Oklahoma Panhandle, has been real since the soil conservation district was organized there in 1949.

Up to that time the several agricultural agencies were plugging along at their own respective jobs. Several years of good crops and favorable prices had just passed, and the agricultural agencies each had their separate offices and separate programs. The district was organized by a few farsighted farmers and ranchers who could remember the Dust Bowl of the thirties, and wanted to do something to prevent another. The board of supervisors realized that the work of the different agencies needed to be coordinated and directed toward the same goal: more conservation on the land and better service to farmers.

A directive from the Secretary of Agriculture to combine all United States Department of Agriculture agencies under one roof where possible was the “shot in the arm” needed to start the agencies working closer together.

The Soil Conservation Service and the Production and Marketing Administration moved into the same office building, along with the

soil conservation district office. They found, through this close association, that they had many problems in common as well as a common objective.

The county agricultural agent and Farmers Home Administration were in the county courthouse, just across the hall from each other, and only two blocks from the PMA and SCS offices.

When the SCS took over the responsibilities of the field work on permanent-type practices from the Agricultural Stabilization and Conservation Committees (formerly the PMA committees) it seemed like the natural thing to do in Cimarron County.

The ASC county committee and office manager began holding their monthly meetings on the same days as the district supervisors, and the two organizations usually ended up with a joint meeting. The vocational agriculture teacher, county agent, and county supervisor for the FHA were always invited to attend these regular meetings.

At the time for development of the county ACP Handbook, all agencies, and their respective advisory committees, are invited to sit in, and all are usually represented.

The district supervisors develop an annual plan of conservation activities. This includes: meetings that the county agent will conduct with the help of others; tours, arranged for by SCS technicians and assisted by boys of

Note.—The author is work unit conservationist, Soil Conservation Service, Boise City, Okla.



Earl Nance of SCS leads a land capability tour for the SCD board of supervisors, the ASC and FHA committees, and FFA boys in Cimarron County.

the Future-Farmers-of-America; informational meetings on the ACP program with discussions led by Warren Hodges, ASC office manager. Each agency has a part of the total job, and the overall program is guided and helped along by the district.

An excellent example of this cooperation came about when the FHA decided to use land capability information as a guide in determining an economical family-size unit and required all its participants in the Great Plains emergency loans to have soil and water conservation plans on their farms.

A tour was arranged by the district supervisors for local heads of the USDA agencies and their committees to study land capability information that would be used. A short meeting was followed by a 2-hour trip in the field, conducted by Earl Nance, area soil scientist of the SCS. The different soil types were discussed and the capability classes shown. Recommended treatments were explained by the local conservationist.

Immediately following this meeting, arrangements were worked out between the SCS and FHA whereby the FHA's farmer-advisory committee would screen all applicants before submitting requests to the SCS for land capability information.

Since that time, the SCS has received about 100 requests for land capability maps and has been rendering 10-day service. Jim Belford, county supervisor for FHA, or his assistant Don Davis, go with the SCS farm planner, and help the farmer and his wife develop the conservation plan and farm-and-home plan out on the farm.

County Agent Eugene Williams has a regular Saturday morning radio program. He often has heads of the different agencies and the vocational agriculture teacher as guests on his program. They discuss problems affecting the farmers and ranchers of Cimarron County.

The FFA class has a plan of conservation activities for the year, and it is tied in with the soil conservation district's annual plan of operations. This year, for example, the FFA boys acquired a display window on Main Street to show timely conservation problems and their solutions. This exhibit is changed weekly. The FFA class assists with a countywide grass and range tour, as well as taking part in the plant identification contest at the county fair. A plaque is awarded by the soil conservation district to the high scoring individual in the FFA and 4-H Clubs.

County Agent Williams and John Coltharp, vocational agriculture instructor, work together

(Continued on page 92)

City Scouts Earn Merit Badges

By A. B. FOSTER

HUNDREDS of thousands of Boy Scouts throughout the country are working for merit badges—badges that show achievement in more than 125 different skills. One of the most coveted, yet one of the hardest to achieve, is in soil and water conservation. It is particularly difficult for city boys to work out the requirements for this badge.

Scouts in Kansas City, Mo., have found a way to get their soil and water conservation merit badge. Through the cooperation of the Johnson County Soil Conservation District, the Soil Conservation Service, the Missouri Conservation Commission, and the farmers in the Blackwater Pilot Watershed in Johnson County, 880 Boy Scouts from greater Kansas City have already worked off the requirements for their

soil and water conservation merit badges. Under the present arrangement many more will do so.

It was not a one-way proposition by any means. W. T. Bailey, who owns a 200-acre farm near Elm in Johnson County, said that it would have taken him a week to plant the 300 rods—about 10,000 plants—of multiflora rose on his place if he had done it alone. The Scouts did the whole job in 2½ hours on a Saturday morning in March 1956. They also planted 250 pine and cedar seedlings for a windbreak.

Bailey's farm was only 1 of 6 farms on which 520 Scouts from 7 troops in Kansas City planted 55,000 multiflora rose and 620 pine and cedar on their March outing—an outing that grew from careful planning and cooperation by several individuals and organizations.

Note.—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.



Otis Thornburn of the Missouri Conservation Commission demonstrates planting techniques to a group of Kansas City Scouts.

Several years ago Paul Hallam, cashier for the Kansas City Power and Light Company, entertained Scout Troop Number 50 on his 375-acre farm in Johnson County, 33 miles from Kansas City. Hallam is counselor for the Kansas City Scout Council, an area including about 10,000 Scouts. To the city boys this outing was a thrilling experience and it was followed by other trips to the farm. So it was natural that when the Hallam farm became part of the Blackwater Pilot Watershed program in 1953, Hallam saw another opportunity to help the Scouts who were at that time launching their national conservation good turn. A new merit badge on soil conservation also had just been adopted.

Kermit Irwin of the Soil Conservation Service in the Johnson County Soil Conservation District, helped Hallam prepare the conservation plan for his farm. The flood prevention phase of his plan included an earth dam that would impound a 10-acre permanent lake with capacity for 60 additional acre-feet of temporary storage for flood control purposes. This body of water looked like a good possibility for wildlife development. The Missouri Conservation Commission was already formally cooperating with the Johnson County district and had planting stock available for multiflora rose and other stock. Hallam was anxious to cooperate on the wildlife phase just as he was on the rest of the conservation program.

So it was agreed to enclose the lake, and two grass waterways leading into it, with a living multiflora rose fence. The fence would protect the area from farm animals and would also provide food and cover for many kinds of wildlife. This would take 6,500 feet of fence—15,000 rose plants. There would also be needed 500 Scotch and loblolly pine for a windbreak.

It was at this time that Hallam suggested that the Scouts who had been coming out to his farm might like a chance to do some planting in connection with working off their merit badge requirements. He arranged with Charles Hart, a leader of the troop he had been inviting out to his farm, for 2 troops—a total of 160 boys—to come out and do the planting. They arrived at the Hallam farm at 9:30 on a Saturday morning in November 1954, accompanied by 30 of their fathers who came along to pre-



A Scout patrol planting multiflora rose.

pare the noon meal. Furrows for planting the rose and trees had been opened at 7 o'clock that morning.

After holding a regular opening Scout ceremony in a nearby pasture, the boys got planting instructions from Otis Thornburn, field service agent for the Missouri Conservation Commission.

The area was divided into 400-foot stations. A scout patrol—6 to 12 boys—headed by a Powder Horn Scout and accompanied by an adult, was given each station to plant. Actual planting started at 10:15 and by 12 noon the job was finished. In addition to the job on Hallam's farm, 600 feet of windbreak and a quarter of a mile of rose was planted on the Merle Shafer farm nearby. Shafer came over and got 15 boys for his job. At noon the dads had the dinner ready and the boys were ready too.

Floyd Roberts, in charge of the sporting goods department for Kansas City's Sears-Roebuck Store, contacted the area council and interested them in taking on this kind of activity for all the Scouts in the city. After seeing the success of the event on the Hallam farm, Roberts was so enthusiastic that he asked Irwin of SCS if he could use 10,000 Scouts from the Kansas City area for a similar event in the spring.

Irwin was astounded. What could he do with 10,000 Scouts, all in one group? It would take 200 buses just to haul them! But it did indicate the number of Scouts who wanted to work in conservation and the problem of finding a way for them to get their merit badges. The soil and water conservation badge is one requirement for becoming an Eagle Scout.

It was agreed that 200 Scouts could be handled for a planting day in the spring of 1955 on the Blackwater watershed. Ten farms would be ready. The biggest job was on Tom Shier's farm where he had a 5-acre lake that needed 6,700 feet of rose fence in addition to some windbreak planting.

Actually 3 troops from Kansas City participated in the planting in April 1955, in addition to 4 troops from Warrensburg and 1 from Holden.

The 200 Scouts set out 45,000 plants on the 10 farms in about 2 hours. The same system of organization was used as in the fall planting. It was agreed that the boys should not work more than 1½ to 2 hours.

No planting was done in the fall of 1955 because of the extremely dry weather. But in March 1956, 520 Scouts, representing 7 troops from Kansas City, planted rose and pine on 6 more farms.



Chow time for Scouts who have been planting trees and shrubs, with the dads serving the meal.

This adds up to 880 Scouts who have worked off the requirements for their conservation merit badges in the 3 outings. This has not only been a real break to the boys and their leaders but it has been a great help to the farmers and to the watershed project as a whole.

Troops 50 and 123, which did the first planting in the fall of 1954, received a Presidential citation in January 1955 in recognition of the job they did.

As a testimonial to the quality of their work, Irwin's staff reports that the survival of the rose plantings is at least 95 percent and the pine almost as good. "This is excellent survival even for professionals," Irwin commented, "and we have had unusually dry weather."

A MISPLACED FARM PLAN.—I have just transferred from 10 years in the Sullivan County (N. H.) Soil Conservation District. As I was packing to leave, the Chester Silvers' told me they'd misplaced their farm plan. My last official act was to assemble another copy of their farm plan for them, and I did so gladly, because the Silvers never treated their conservation farm plan lightly.

To them their conservation plan was exactly what the soil conservation district intended—a design for efficient farming, a future for every acre of their Newport hillside, and a future for the Silver family, too.

Every time they added a practice Chet or Mrs. Silver, or both, would ask, "Where do we go from here? How will this work out when we get those other practices going?"

And how they used that plan! Used it to build a water storage pond for their registered Guernsey and Angus herds. Used it again to enlarge the pond and irrigate their berries. Even used it to get cooperation from the town. I remember that time the highway department took one look and said, "Sure, we'll meet you halfway." And they did—rebuilt a road ditch to outlet the Silvers' 600-foot pasture waterway.

Yes, and they used their farm plan to locate more raspberry land when business boomed; and to tile-drain the land to boost yields; and right now I hear they're using it to find an added pond site for more sprinkling water.

I could go on. But the point I wish to make is this: A conservationist puts a bit of himself into every farm plan he works on. To him, it really lives; it grows with use; and, as it grows, it gives greater service.

So, I was delighted to replace the Silvers' lost farm plan as I left the Claremont work unit office, and I was happy to receive their invitation to look them up any time I got back that way.

—LESLIE BLAISDELL

A Long View On Pines

By J. H. CHEEK

PLANTING pine seeds to grow seedlings for farmers to reforest their land, with the intention of buying them back in 10 to 20 years to process and resell as creosoted posts and poles, is taking a long look at pine.

The possibilities of this venture are too "futuristic" for the shortsighted but not for C. W. Gearner, rancher and owner of the Texas Creosoting Pole and Post Company of Mineola, Tex. He says, "It is a necessary cycle essential to the future operation of my business."

Mineola is located on the western edge of the pine belt of east Texas in the Wood Soil Conservation District. Approximately 200,000 acres of land within a 30-mile radius of Mineola was formerly covered with pine trees, three-fourths of which have been destroyed by improper cutting methods, fire, and clearing for other purposes.

About 50,000 acres, ranging from poor to good, are now scattered over the eastern part of the district. There is another 50,000 acres in old fields and worthless hardwood that is better adapted to growing pine than any other crop. This is the land that Gearner is trying to help reforest. He plans to continue in the nursery business until the demand can be satisfied from public or other private sources.

Gearner is gambling \$5,000—cost of the operation—that the 3 million pine seeds he planted in a 2-acre nursery March 29, 1956 will grow more than a million seedlings for soil conservation district cooperators to transplant onto more than a thousand acres of deep sandy land next winter. Also, he is gambling that in about 10 years he can begin buying back these trees for his plant to treat and resell as creosoted poles and posts.

The need for additional plantings of pine in this area was seen by Gearner as he traveled through the country searching for timber to buy for his creosoting business. He realized unless something was done about it there would be no timber for posts and poles in a few years.

Knowing that many farmers had been unable to buy seedlings to plant during the last 2 years he decided to put in a pine nursery to help supply the demand.

Before starting the project, Gearner visited the nurseries of the Texas Forest Service at Alto and the Red River Arsenal near Texarkana to find out all he could about growing pine seedlings.

Local Soil Conservation Service technicians assisted by selecting the site, analyzing the soil, designing the irrigation system, and furnishing other technical information needed to get the project under way. They expect to continue giving technical aid until the trees are harvested. Gearner has been a cooperator with the Wood Soil Conservation District for the past 8 years.

In selecting the nursery site the kind of soil, topography, nearness to existing water supply, and type of vegetation on the land were taken into consideration. Both chemical and physical soils analyses were made. The physical analysis was used primarily to determine the relationship of soil, moisture, and plant.



C. W. Gearner looks over his pine nursery—note the sprinkler irrigation system operating in the background.

Note.—The author is work unit conservationist, Soil Conservation Service, Mineola, Tex.

The chemical tests were run to find out if the soil contained any harmful elements and the kind of fertilizers needed.

The site selected was moundy and had to be leveled with a bulldozer and grader. The vegetation was pushed off to eliminate as much as possible trouble from grass and weeds. The ground was flat-broken and double disked. Then 50 beds, 400 feet long and 34 inches wide, were thrown up leaving a balk, or middle, 18 inches wide for irrigation pipe and walking space.

Before the land was bedded, 1,500 pounds of 5-10-5 fertilizer per acre was disked into the soil. Another 500 pounds per acre was put on top of the beds and worked in the soil to a depth of 1 inch.

Planting was done with a fertilizer distributor that seeded 2 of the 34-inch rows at once. The holes in the distributor directly over the middles were plugged to prevent planting seeds off the rows. The rate of seeding desired was 50 seeds per square foot—enough to grow about 30 seedlings for harvesting. The trial and error method was used and proved to be almost perfect as only 1 pound of seed was left after the 2 acres were planted.



J. H. Cheek (left) and C. W. Gearner inspect a seedling grown on the Gearner nursery.

Fifty pounds of slash and 125 pounds of loblolly costing \$850 were planted. The slash averaged 18,500 seeds to the pound and the loblolly 22,500. The loblolly seeds are smaller and harder than the slash and require longer to germinate unless they are put through a softening process called stratification. A recent count indicated that about 50 percent of the seeds planted were up and growing.

Pine straw was used on the beds for protection of the seeds. It was put on by a manure spreader and evened by hand. Too much straw was put on in some places and part of it had to be removed since the extra thickness prevented the seedlings from emerging.

The irrigation system was designed by SCS engineers. The water is lifted from a deep well into a reservoir then pumped directly into the lines. The system is the sprinkler type, consisting of 500 feet of 3-inch pipe carrying 2-foot risers with spray heads every 40 feet. Penetration tests were made to determine the time required to obtain proper saturation of the soil.

Keeping the weeds out of the seedlings is one of Gearner's big jobs. He uses both hand labor and chemicals to keep the nursery clean. Spraying with chemicals is much cheaper than weeding by hand; but some handwork is necessary to eliminate certain kinds of weeds not easily killed by chemicals.

Damping-off is the most serious disease he has to contend with. It is caused by fungi that kill seedlings from the start of germination until 6 or 7 weeks after emergence. No signs of damping-off were observed but the spray was used as a preventive measure.

Cutworms, ants, red spiders, and grubs are some of the insects Gearner has to guard against. Pocket gophers are always a threat to most any growing plant and have given some trouble.

Birds have not done much damage, as a guard was kept on duty from daylight to dark every day until the plants were too large to be damaged.

December is usually the beginning of harvest time in east Texas. Inventories will be made at intervals to determine as near as possible the number of seedlings that will be available for delivery. More laborers will be used at this season than any other as the job of

lifting, culling, and packing will be a major operation. Gearner would like to have seedlings with 10-inch tops and 7- to 8-inch roots at digging time.

Selling the trees has been the easiest and least expensive job Gearner has encountered. All he had to do was to have some order blanks printed. Soil conservation districts within a 50-mile radius of his nursery requested more than 2 million trees before all the seeds had come up. He plans to sell all his trees through soil conservation districts.

If Gearner's project is a success—and it looks as though it will be—other private nurseries probably will be started in 1957. Visitors have indicated their intentions to grow pine for their districts next year.

Nine Fields Become One

By removing old stonewall and brush hedges, and adopting contour farming and other conservation practices, a New Jersey farmer increases efficiency and yields.

By DONALD K. WOLFF

JOHN ROMANI used to have 9 small fields bordered by more than a mile of hedgerows. The 9 fields totalled 64½ acres. Now he has 1 field of 74 acres. The stonewall hedgerows with their intermingled brush are gone. He picked up 9½ acres by removing them.

By making 1 field out of the 9, Romani has cut plowing and planting time in half. "I used to make 340 turns in the small fields," he explained. "Now I make only 40. Besides, there's



Mr. and Mrs. Romani checking their farm conservation plan.

less chance for 'misses' now. I don't have to stop and start my corn planter so often."

Romani became a cooperator with the district last spring and agreed to apply to his farm all the conservation measures needed to protect his soil against erosion and to keep its fertility at top level.

His conservation work has attracted much public attention because his farm is a sort of showcase. It's on the much-traveled Belvidere-Phillipsburg Road in New Jersey. Romani likes the attention his conservation work is getting. "Maybe it'll inspire others," he said.

Removing the hedgerows is just a small part of Romani's conservation program. Soon as he got this done, he put in contour strips.

While it's a little early to show consistent higher crop yields from his conservation work, Romani believes the contour strips have helped already. Despite the dry weather of 1955, he harvested 80 bushels of oats and 100 bushels of corn per acre where he had his strips. Prior to putting in contour strips, he got only 70 bushels of oats and 80 bushels of corn per acre in years of good weather. The hay strips yielded 4 tons to the acre compared to 3 tons formerly harvested.

Note.—The author is work unit conservationist, Soil Conservation Service, Belvidere, N. J.

"In the field that was contour stripped, I got full advantage of my seed, lime, fertilizer, and what little rain that fell," Romani said. "None of it washed down the hill to be lost forever."

Romani farms 200 acres. He has been interested in conservation for a long time. One thing after another, however, kept him from getting started on a conservation program until last spring. Then, when he became a co-operator with the Warren County Soil Conservation District, he and I went over every acre of his farm. We worked out his conservation plan as we went. Then he started to put the plan into effect.

After the hedgerows were out of the way, the new 74-acre field was laid out in contour strips. Oats and corn were planted in alternate strips on 34 acres. Then, in the spring of 1956 he put 20 acres more in contour strips. The rest will go in next year.

Under his conservation plan, Romani will plant a cover crop in all corn at the last cultivation. That's to protect the soil and maintain fertility and good soil structure. He will give 50 acres of pasture intensive care, including the reseeding to grasses and clovers and liming and fertilizing as needed. The livestock will be rotated and all grazing will be stopped at certain times to give the forage plants a chance to recover, reseed, and develop.

Romani has realigned his pastures by removing another 1,000 feet of stone hedgerows. In this adjustment he planted over 6,000 feet of multiflora rose living fences. Another 1,200 feet of these living fences will be planted in 1957.

Romani's remaining conservation job includes clearing brush from 4 acres of Class II land that has been idle for years. He'll then work that area into his stripcropping program. He intends to improve the drainage on 16 acres of pastures by putting in open ditches. An irrigation pond is to be built jointly with his neighbor.

His conservation crop rotation consists of corn for 2 years, oats for 1 year, and hay for 3 years or longer. He has about 60 dairy cows, 10 yearlings and calves, and 200 laying hens.

"I'm a little late in getting started," Romani said, "but I hope to make up for lost time. I've always thought that conservation was the thing for me. Now I know."

FARM WINDBREAKS.—Roy Melendy has 5 windbreaks covering about 14 acres of his wheatland. He says, "I'm not concerned with the dollars and cents angle but with the comfort of having tree windbreaks and the pheasants that live in the trees. There are also blackbirds, redbirds, doves, and sparrows making their homes in my tree groves."

Roy came to northeastern Colorado from central Nebraska in 1940 and bought 640 acres of rolling wheatland north of Otis, Colo. Since then conservation farming practices such as terracing, contour farming, and stubble mulching have paid dividends in dollar profits and the saving of topsoil and soil fertility. The tree planting operations have helped greatly.

The first few years after coming to Colorado, Melendy missed the trees that he had been used to in Nebraska. In 1949, the Soil Conservation Service and the Colorado State Game and Fish Department made available to farmers trees for farmstead and field windbreak plantings. Roy was one of the first to take advantage of this program.

Roy prefers 10-row windbreaks because the trees furnish protection and cover for wildlife. From pheasant cover standpoint, 8 rows north and south do the job of 10 rows east and west. The trees are mainly squawbush, American plum, chokecherry, Russian olive, Chinese elm, Rocky Mountain red cedar, and Ponderosa pine. His cattle can feed with comfort behind the windbreaks during the winter. Snow is caught and held in the trees leaving the corrals and buildings free from snow.



Roy Melendy and one of his young field windbreaks.

Approximately one-fourth of Washington County's 1,200 farms have farmstead and field windbreaks covering more than 1,000 acres. Estimates indicate that more than half the county's farms will have farmstead windbreaks in another 10 years now that farmers like Roy Melendy have shown the way.

—DICK CONRAD

*There's no better Christmas gift than a
subscription to this magazine.*

Quality Cattle and Range

By WINFIELD S. CATON

HIGH quality cattle and abundant nutritious grasses are paramount dreams of most ranchers and range conservationists. J. D. Ackerman, owner and operator of the Turkey Track Ranch, 35 miles southeast of Colorado Springs, Colo., is making this dream come true.

Ackerman, who is president of the board of supervisors of the Central Colorado Soil Conservation District, operates the Turkey Track on a cow-calf-steer basis. His feeder steers have topped the market several times and just this year were awarded the reserve championship at the International Livestock Exposition in Chicago.

In spite of severe drought and high velocity spring winds in recent years, the condition and production of his ranges have improved each year. Climax species of grasses are increasing, vigor is on the uptrend, and litter is building up with each season. All this is the result of careful planning in the management and use of each pasture.

Note.—The author is work unit conservationist. Soil Conservation Service, Colorado Springs, Colo.

Success of the operations on the Turkey Track began with a herd improvement program. Though the larger portion of the breeding herd consists of grade Herefords, Ackerman has a small herd of purebreds. By careful selection of replacement heifers and use of good range bulls, the quality of his cattle is improving with each generation. His aim is to produce more pounds of beef from a smaller number of cattle.

The grass management program on the Turkey Track presents a complex problem. Range sites vary from sandhills with fine shifting sands to clay uplands with heavy soils derived from Pierre shales. Average annual rainfall is 12 to 13 inches. Topography varies from rolling plains to hills with slopes of 15 or 20 percent. Each pasture has its own particular problems. Using his range sites as a basis for management, Ackerman, cooperating with the Central Colorado Soil Conservation District and technicians of the Soil Conservation Service, is carrying out a complete range conservation and management plan. Briefly, his plan is to benefit and encourage growth and production of good



Driving heifers from the summer range to the winter range on the Ackerman ranch. Note the substantial amount of forage left on the range.



J. D. Ackerman and his favorite horse in a corral on the Turkey Track Ranch.

species of grasses at the expense of inferior grasses and annual weeds. Stock water plans provide a system of dams, wells, and springs so located that in no instance are watering places more than $1\frac{1}{2}$ miles apart.

Grass management followed by Mr. Ackerman in the overall use of his ranges has resulted in an upward trend. Climax species of grasses, such as sand bluestem, little bluestem, needle-grasses, blue grama, side-oats grama, switch-grass, western wheatgrass, and alkali sacaton are on the increase. The composition of the range is reaching the maximum in important species desired for excellent condition. The vigor of these key species has been improving with each growing season. Litter is adequate and wind and water erosion have been practically halted.

Structural conservation practices such as diversions, water spreaders, development of stock water and erosion control dams, spring development, and contour chiseling and pitting have aided in the recovery of the ranges, but have played only a minor role in the overall improvement. The real solution has been the development, and more important, the carrying out of a sound grass management program.

The going has been slow and tough. The past 7 years of drought were discouraging, and the high velocity spring winds seemed determined to destroy all the advances that had been made after years of carefully executed plans. But the determination of the grasses matched that of Ackerman and now it can be seen that victory will be theirs.

Ackerman is claiming no glory for having done a good job. To him, the reward has been in marketing cattle of the highest quality and having a range of vigorous, nutritious grasses.

CIMMARON COUNTY

(Continued from page 83)

in preparing a catalog for the county fair, and arranging for livestock shows and sales.

When differences of opinion occur, the agencies involved immediately get together and work out the problem. Lack of understanding is the usual cause of hard feelings. Working closely together, with a sincere desire to understand the other fellow's viewpoint, has certainly contributed to closer cooperation.

DISTRICT PROFILE

ALLEN SMITH
of
SOUTH DAKOTA

ALLEN SMITH, Kadoka, S. Dak., rancher, county commissioner, supervisor of Jackson-Washabaugh Soil Conservation District, school board member, Greater South Dakota Association award winner, and a man of numerous other activities, is very modest. He doesn't like to talk about himself.

Smith is a conservation rancher who has proved to his own satisfaction that conservation pays good dividends. At any time of the year the grass looks good on his ranch because it is used properly. He believes in the policy "take half and leave half." His stock always look good because of lush grazing during the grazing season and plenty of good hay during the winter. He usually has about 21 acres available grazing for each cow.

The results of proper range management are evident. For many years now his cows have produced more than a 98 percent calf crop. This year they all calved within a 40-day period. As a result, the calves are uniform in age as well as in quality. In previous years he has nearly always topped the market with his calves.

Smith has always purchased top sires, which he keeps confined until breeding time. At breeding time cows are placed in excellent pastures with 1 bull for each 25 cows. By careful culling very few cows are barren, and if they are they are disposed of immediately.

Winter feeding is not a serious problem as Smith always has a good supply of hay. Several years ago he began a program to increase hay production. He accomplished this by water spreading. From several large drainages he diverted the water to his more level lands. When it reaches these lands, it is slowed down with ditches and dikes so that very little of the water leaves his land. This additional water on the hay land has increased production considerably. The extensive use of alfalfa with native grass has also contributed to the increase in production.

Community activities have a high priority on

Smith's agenda. He is presently a county commissioner. Among his many duties he has given considerable study to the new tax laws and how they affect his constituents. He is vitally interested in school problems and in improving roads in the county.

As a supervisor of the Jackson-Washabaugh Soil Conservation District, Smith has actively encouraged the varied programs of the district, especially those that inform school children about conservation. For many years the district has sponsored conservation awards for school children in Jackson and Washabaugh Counties. This year students from every school in the two counties participated in the district program.

Smith has been a vigorous supporter of the local hospital. He and his wife have participated in fund drives for this cause and have helped considerably with programs sponsored by the hospital auxiliary. As a result of the efforts of the Smiths and others, the local hospital is in good financial condition.

It is difficult to find any community activity that the Smiths have not been assisting. It is almost impossible to find a person in the community who does not know them. Chances are that if you meet Smith on the street he will be in his working clothes. He will probably be busy too, but not too busy to visit a little, and before long the conversation will center on his chief interest—conservation.

—HUGH N. HILLER



Allen Smith

Districts Help Revive Nursery

By HAROLD L. HARRIS

THIRTEEN soil conservation districts, acting through the leadership of South Bingham (Idaho) Soil Conservation District, have had a big part in putting the Soil Conservation Service grass nursery at Aberdeen, Idaho, back into full-time and full-scale operation.

These soil conservation districts—11 in Idaho and 1 each in Utah and Nevada—provided the money, bought the land, and leased it to the nursery for the continuing production of seed for district increase blocks and seed of promising new strains to use in field-scale plantings.

Note.—The author is manager of the Soil Conservation Service nursery at Aberdeen, Idaho.

Started in 1939 to supply technical data and guidance to the grassland program of the Western States, the Aberdeen Soil Conservation Service Nursery operated continuously through 1953 when it was discontinued by decision of Congress. Standby funds were provided to maintain nursery material, pending a decision on operation of the nursery by the State. The 1955 session of the Idaho State Legislature declined to take over this responsibility because, it held, the operation is of national scope since it directly serves Idaho, Utah, and Nevada and indirectly serves other Western States. With this determination in Idaho, the Congress



Supervisors of the South Bingham Soil Conservation District, Idaho (left to right, standing) Bill Webb, Blaine Sasser, Brice Beck, LeRoy Bowman, and James Prestidge; (seated) Leonard Cornforth and LaMar Whyte.



A group of soil conservation district supervisors from Utah inspects grass evaluation plantings at the Aberdeen nursery.

supplied funds to activate the nursery.

A new cooperative agreement, entered into with the Idaho agricultural experiment stations, helped give the enterprise new life by coordinating activities and eliminating possible duplication of effort. Through the agreement, lands were provided on the Aberdeen Experiment Station and the Tetonia Experiment Station to continue evaluating new strains of grasses and legumes.

In addition, lands were needed for the production of foundation seeds for district seed increase blocks and for the production of seeds of promising strains for field-scale plantings in the seven Western States. In the past this seed production program had been operated on rented lands subject to sale or rental in-



Trial plantings of new accessions on the Aberdeen nursery.

crease, either of which could defeat the program. South Bingham Soil Conservation District supervisors decided that a permanent home for the nursery would be a definite asset to the community and the nursery, and at the same time safeguard a continuing contribution to the conservation and grassland movements of the Western States. After looking over several farms, the board selected the Ernest Landvatter place, 2 miles north of Aberdeen, as a suitable spot from the standpoint of soil, location, and cost.



A soil conservation district seed increase field in the South Bingham district of Idaho.

Then it was necessary to raise money to make the purchase. South Bingham Soil Conservation District, just a year old and without a source of income, explored the possibilities. After many evenings of discussion its supervisors decided to ask the help of other district governing bodies in Idaho, Utah, and Nevada. Through legal advice, contracts were developed giving each lender a first mortgage on a percentage-of-loan-basis on the farm and a promissory note to pay 4 percent interest with repayment annually.

The legal end cleared, they contacted other districts. Response was enthusiastic and rapid. Within a month the money was in hand and the contracts completed. Loans varied from

\$100 to \$3,750. Soil conservation districts that dug into their bank accounts to make the loans include White Pine of Nevada; Weber of Utah; and Oneida, Gooding, Power, Dry Creek, Boundary, North Side, Latah, Bear Lake, Benewah, and Nez Perce of Idaho.

With the signing of the last paper the board leased the farm to the Soil Conservation Service for nursery operations. After the farm indebtedness is cleared, the South Bingham Soil Conservation District will use the lease money to further the conservation program in that district and for community betterment.

Those who helped secure money to buy the farm include district supervisors LaMar Whyte, chairman; Blaine Sasser, vice chairman; Leonard Cornforth, secretary-treasurer; John Heer and Bruce Beck; and alternate supervisors William Webb, LeRoy Bowman, James Presridge, Walter Dirks, and Lenard Schritter.

After the lease was signed the nursery staff began to put the land into production. With the help of local SCS conservationists a contour map of the farm was made, the irrigation system was revised, and fields were staked for land leveling. Bob Hensen, local leveling contractor, helped put the fields in shape for irrigation. The Idaho Concrete Products Company, Pocatello, contributed three 18-inch concrete culverts, one 12-inch concrete culvert, and fourteen 12-inch concrete headgates for ditch controls.

When leveling operations were finished employees of SCS at the nursery began converting the existing field of wheat, alfalfa, and pasture to grass. Seeding operations started July 3, 1955. When this work is completed, the farm will include 9 acres of Topar wheatgrass, 4 acres of Sodar wheatgrass, 4 acres of stiporyzopsis (a cross between native needlegrass and native Indian ricegrass); 8 acres of Siberian wheatgrass, 4½ acres of a new bluebunch wheatgrass and several small plots of new or specialized strains.

LaMar Whyte, chairman, South Bingham Soil Conservation District, says, "We board members often wondered if we were doing the right thing. Now that it is over, we know that we did because everyone interested in the grassland program will benefit—the community, the district, the State, and the Nation. We sincerely thank all those who helped, especially the other districts that loaned us the money to make the purchase possible."

GAINS INTEREST.—Wendell H. Steedly, work unit conservationist at Georgetown, S. C., has a list of "satisfied customers" in his notebook, classified according to conservation practices being carried out on their respective farms. He uses the list in talking with prospective district cooperators and says it is very helpful in getting their interest.

CONSERVATION AWARDS.—Five nationally known conservationists were selected to serve on the awards committee for the 1956 Nash Conservation Awards Program. They are: Ted Pettit, national conservation director of the Boy Scouts of America; Dr. E. Laurence Palmer, conservation director of the National Wildlife Federation; Arthur H. Carhart, author of "Water or Your Life" and other books on conservation; Lou Klewer, outdoor columnist for the *Toledo Blade*, Ohio, and president of the Outdoor Writers Association of America; and Michael Hudoba, Washington correspondent of *Sports Afield* magazine.

Ten awards, each consisting of \$500 and a bronze plaque, will go to professional conservationists, and 10 awards of bronze plaques will go to nonprofessionals.

The Nash conservation program was started in 1953.

THE INCAS AND LAND CAPABILITY.—The Incas provided for settlement of their new conquests by ordering a census to be taken of the population, and a careful survey to be made of the country, ascertaining its products, and the *character of its soil*. From *Conquest of Peru*, Vol. I., by William H. Prescott.



December 1956

SOIL CONSERVATION

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION.

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SECRETARY OF AGRICULTURE

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U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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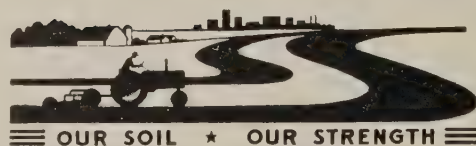
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SOIL INSECTICIDES TESTED.—In experiments to determine the effects of aldrin and dieldrin on soil micro-organisms and soil microbial processes. W. A. Ayers, P. A. Hahn, and O. N. Allen, University of Wisconsin bacteriologists, came to the conclusion that these soil insecticides don't harm beneficial soil-micro-organisms when they are used in normal amounts.

They started the experiments mainly to learn whether these insecticides had any effect on the populations of bacteria, streptomycetes, and fungi in the soil. They also investigated changes in the ability of these organisms to break down soil compounds to ammonia, to build nitrates from the ammonia, and to release carbon dioxide during the process. The tests were conducted on soils with different proportions of carbon and nitrogen.

At dosages of less than 10 pounds per acre, neither aldrin nor dieldrin was harmful; nitrification, ammonification, and carbon dioxide evolution progressed normally. Also, the different carbon-nitrogen ratios had no effect.

Editors are invited to reprint material originating in this magazine.



FRONT COVER.—An early winter scene near the top of a watershed in the Rocky Mountains of Colorado.

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Cranberry Problems Solved

Conservation planning helps cranberry farmers solve some of their numerous problems.

By DARRELL R. SHEPHERD

ALL farmers have problems. So do cranberry farmers, whether running bogs in Massachusetts, New Jersey, Wisconsin, Oregon, or Washington. These bogmen get little rest in their fight against plain and fancy plant diseases, blights, fungi, worms, insects, mites, freezes, scalds, droughts, floods, soil decline, and price squeezes. Conservation planning, however, is helping them out of some of their worst doldrums.

The cranberry farmer's most important problem is water, in one way or another, according to Arnold C. Lane, chairman of the board of

supervisors of the Barnstable Soil Conservation District on Cape Cod, Mass. The district, with an assist from Soil Conservation Service technicians, has been helping cooperating farmers solve their soil and water problems. Lane is also an employee of the National Cranberry Association, which naturally has an interest in how well the growers do. He is a cranberry farmer himself and bought a rundown bog to see if he could bring it back into profitable production through conservation methods.

"The cranberry business depends mainly on water," Lane said. "We depend on water for irrigation. We depend on water for frost protection. And if we want to stay in business,

Note.—The author is work unit conservationist, Soil Conservation Service, Hyannis, Mass.



High producing cranberry bog with sprinkler irrigation system on Onni Niemi farm.



Onni Niemi (right) shows Darrell R. Shepherd of SCS how well his cranberries are doing in rebuilt bog.

we've got to be able to get water on and off our bogs quickly when we need to.

"The first thing to know is that you can get enough water over your bog whenever the cranberry plants need it, and that you can drain the water at least 2 feet down whenever you want to get the water off.

"To succeed as a cranberry grower, you have to have a properly built bog to start with," Lane pointed out. "If it isn't built right, it has to be rebuilt for good production."

"Then," he added, "the way to bring acre-yields up is to use water efficiently. That's where the Soil Conservation Service helps. It

has engineers, hydrologists, and other technicians who know how to design and lay out drainage and irrigation systems that can handle the job that needs to be done.

"Massachusetts cranberry growers have known about these water problems for a long time," he went on. "But they have lacked the technical and scientific knowledge needed to solve the problems. They did well enough when you consider that few of them had the necessary technical help. The main trouble has been that their ditches, flumes, and spillways have been too small."

That is being corrected as Soil Conservation Service technicians help cooperating farmers with their soil and water problems. The main technical problems involved are: (1) Constructing drainage outlets with proper size and grade; (2) constructing water control structures of proper size and materials; (3) getting rid of wet spots by open or tile drains; (4) laying out the right kind of border ditches; (5) building water-tight dikes; (6) holding the banks of dikes and canals in place with grass; (7) grading the bogs properly for complete surface drainage and for better and cheaper use of water; (8) finding water supplies; (9) designing water systems for both irrigation and frost protection; and (10) learning when and how much to irrigate according to the needs of the different kinds of soils in the bog.



Handscooping cranberries on the A. D. Makepeace farm.



Harvesting cranberries by machine on the farm of Dr. Harold Rowley.

The conservation program also includes planting the right kind of vegetation in odd areas around the bogs to help wildlife. In Plymouth and Barnstable Counties, shrub lespedeza is good for this purpose.

Onni Niemi is a Cape Cod cranberry grower who has shown what can be done with yields when you follow a conservation program.

Niemi has had his bogs since 1936, but under old-fashioned farming methods production had dropped very low. So in 1946 Niemi began to rebuild his bogs. He now has 3½ acres in production, and is remaking another 1½ acres.

In 1952, 3 acres produced 320 barrels of cranberries; in 1953, 466 barrels; in 1954, 350 barrels; and in 1955, a poor year all around, 258 barrels. That's a 4-year average of 116 barrels an acre. Massachusetts average is about 40 barrels an acre.

Niemi said that he gets the big yields mainly because he has a level bog with ditches big and good enough to do their job, and he can water and fertilize through his sprinkler system as needed.

A dugout pond can supply 60,000 gallons of

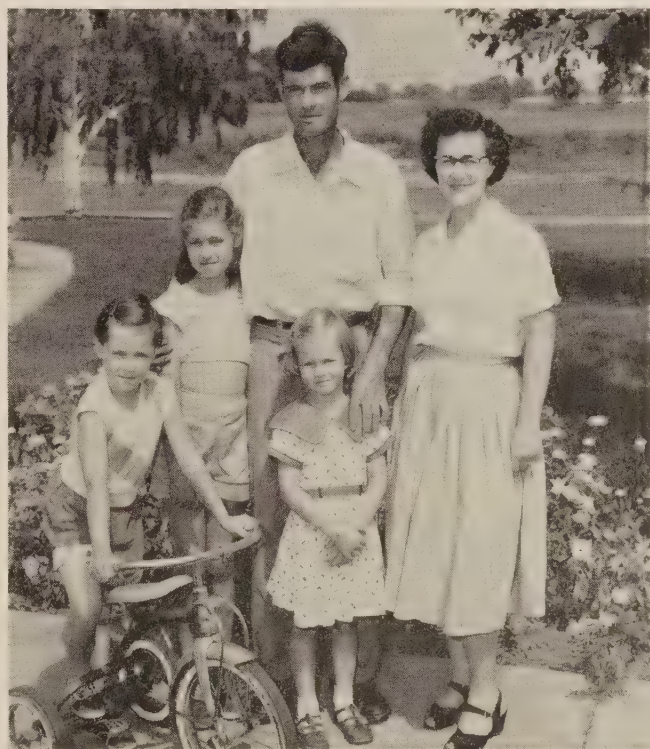
water a day. It refills in 24 hours. In 1953, when Niemi saw a bumper crop coming that needed an extra "shot in the arm," he pumped a nitrogen solution through his sprinkler system. Early in June he usually gives weak spots an extra broadcast of 7-7-7 fertilizer. Late in June he broadcasts 7-7-7 over the whole bog, 400 pounds to the acre.

In addition, Niemi controls weeds carefully by hand and chemicals. He maintains healthy vines to get more uprights, more berries. And keeps enough bees around to do a complete pollination job.

A GRASSLAND FARMER

Norman Nellen, of the Carver County (Minn.) Soil Conservation District, has been secretary-treasurer of the district board of supervisors for 9 years, since the organization of the district. He was raised on a farm in Carver County and attended the Minnesota College of Agriculture where he majored in soils and agronomy. He is now operating a 145-acre farm in that locality.

Nellen is a firm believer in soil and water conservation. His wife, Mildred, who was born and raised in



Norman Nellen and family.



Bunker silo filled with grass silage on Nellen farm.

Minneapolis, is just as enthusiastic about soil and water conservation as is her husband. The Nellens are great believers in keeping the land in grass and in feeding more good forage and less concentrates to dairy cows.

As a matter of fact the entire 145 acres is in grass, and the herd of 34 Holsteins is fed mostly on good forage—pasture, hay, and grass silage. Norman's goal is high production of good forage from every acre of the farm.

The Nellens feel that their net income is just as high as it would be if they used a corn, grain, hay rotation. Norman also emphasized the fact that under his grassland farming system he is conserving soil and water in about the most effective way possible, and that the organic matter and fertility level of his soil is going up all the time. He also believes that low cost of production is an important factor in making a net profit.

Norman has seen the Carver County Soil Conservation District develop through the different stages since it was organized in 1946. He saw how at first only the leading farmers were willing to sign up and plan proper land use and soil conservation practices for their farms. Later on, other farmers became ready and willing to go into the program. At present almost one-third of the farmers are district cooperators.

Besides being very active as secretary-treasurer of the district board of supervisors, Norman is on the local school board, is a deacon in his church, is on the county American Dairy Association committee, and has served on the membership committee of the county Farm Bureau. He also pioneered in the use of long grass silage and in the "ration-a-day" system of grazing.

—A. B. FOSTER

ANNUAL REPORT STATISTICS.—During the fiscal year 1956, the Soil Conservation Service assisted 2,700 soil conservation districts, 33 more than during the previous year. Nearly 123,000 farmers and ranchers became district cooperators during the year. About 89,000 basic plans were developed. Soil surveys were completed on more than 31 million acres, while range site surveys were made on nearly 11 million acres.

Shade Tobacco

By H. E. VAN ARSDALL and W. D. GRIFFIN

MANY specialized crops present serious conservation problems. Farmers are often so intent on the high returns they get from crops that they fail to give adequate consideration to the land. Shade-grown tobacco in the Gadsen Soil Conservation District in Florida is an exception. Its profitable growth depends on a well balanced farming program.

This type of tobacco is grown from planting to harvest under shade. In the Gadsden District it is a \$9 million crop, representing two-thirds of the gross farm income. On the average farm only about 10 percent of the land is suitable for tobacco, so this acreage must be carefully conserved.

Soils where shade tobacco is grown must have high organic matter content for success-

Note.—The authors, both with Soil Conservation Service, are, respectively, management agronomist, Lake City, Fla., and work unit conservationist, Quincy, Fla.



Harvesting shade grown tobacco.



Cultivating tobacco grown under shade in the Gadsen Soil Conservation District.

ful production. Animal manure and residues from both native vegetation and green manure crops are used to keep these soils in a highly productive state. About 10 tons of animal manure per acre is applied on the 4,500 acres of shade tobacco grown in the district each year.

Steer feeding to provide manure for tobacco land started about 30 years ago. This enterprise has grown to such an extent that last year 12,000 steers were marketed from feed lots in the district. The production of manure amounts to about 36,000 tons annually.

The common cocklebur is one of the unusual crops used for green manure. Its resistance to rootknot and its rapid growth make it especially desirable. Within a few weeks after tobacco harvest in July this weed is 3 to 4 feet tall in the "shade," and provides land protection and a large volume of potential green manure.

Highly fertilized small grain is the usual winter cover crop. It is neither grazed nor harvested, the total growth being turned under as green manure. Many district cooperators follow a 2-year rotation of corn and tobacco. Corn yields average 80 bushels per acre, while 100 bushel yields are not uncommon, indicating a high state of soil fertility.

When the district was organized in 1941, soil loss from tobacco lands was heavy. Ter-

aces were needed, and a modified broadbase terrace was developed. It was designed to permit sufficiently rapid discharge of water to prevent plant scalding. Water disposal areas were developed by planting Bahia grass waterways.

Irrigation was being used on about 10 percent of the tobacco land when the district was organized. Today, 90 to 95 percent of the crop is irrigated, largely by water from ponds designed by Soil Conservation Service personnel working in the district. Maxwell Strom, a supervisor of the district since its organization, estimates this practice has increased the value of tobacco by 40 percent and has been of considerable value to other crops.

Pasture development was greatly needed when the district was organized. The increase from 3,000 acres in 1941 to 25,000 acres today, shows the importance of this conservation measure that fits in so well with tobacco production. Most of the pasture has been developed on land unsuited for cultivation.

Thus, conservation measures such as terracing, water disposal, pasture development, green manuring, farm ponds, irrigation, and good land use that the district has been promoting have supplemented the specialized production of shade tobacco. Conversely, the production of tobacco on the valuable lands of the district has encouraged a sound conservation program.

Across The Sea To Success

A 15-year-old immigrant boy becomes a leading conservation farmer within 35 years.

By A. B. FOSTER

IN 1921, Carl Gobrecht, a fifteen-year-old lad, traveled alone from Germany to America to start a new life in the New World. His father, a forester near Hanover, Germany, had told the boy there was no future for him in his homeland.

Carl Gobrecht now owns 2 farms in Lafayette County, Wis.,—the 160 acres where he lives and raised his family, and a 200-acre neighboring farm bought in 1954 where his son, Dick, now lives.

Carl is president of the Mound Branch Watershed Association, an organization he helped his neighbors get started. He is a member of the Soil Conservation Society of America. He was awarded a plaque as the outstanding farmer from his area in 1948. In 1951, he won a trip to Beltsville, Md., after winning the county and area grassland contest. In 1952, he won the county corn yield contest with a plot average of 178 bushels per acre.

Note.—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.

In the spring of 1954, Carl sponsored and conducted a private soil conservation field day on the 200-acre farm he had just bought. Soil Conservation Service men from three counties helped lay out strips, a pond, and waterways, in addition to the overall conservation plan. Between 500 and 600 people attended the field day and saw pasture renovations, pond construction, tree planting, a waterway constructed and seeded, anhydrous ammonia and lime applied, and other conservation practices.

When Carl first landed in America he went to work for his brother Fritz, who had come to the United States earlier and was farming in Lafayette County. He later worked for neighboring farmers. During one winter things were so tough he worked without wages in order to have a place to stay.

By carefully managing his finances Carl got enough capital together to rent a farm. It was about this time that he asked Elva Kinch, an attractive rural school teacher, to become his life partner. "My success was assured when she agreed," Carl says.

The 160-acre farm where the Gobrechts now live was not a strange farm to Carl when he bought it in 1941. In fact, he had lived near the farm and had watched its decline since he came to the neighborhood as a boy.

"This farm was a garden of Eden when I first saw it in 1921," Carl says. "Corn yields were 70 to 80 bushels per acre. Other crops yielded as high in proportion. But, during the twenties and thirties the farm deteriorated until erosion and overcropping had reduced it to a wornout, gullied waste. There were three large gullies on the farm and a lot of sheet erosion and shoestring gullies. The buildings were completely shot.

Having lived near the farm all this time, and knowing what the land had been like, Carl was convinced that it could be built back.



Mr. and Mrs. Carl Gobrecht.



Carl Gobrecht harvesting grain on a stripcropped field.

Against the advice of many people familiar with the place, he negotiated a Farm Security tenant purchase contract and bought the farm in 1941.

Carl called on Bruno Zucollo, local Soil Conservation Service technician, even before he moved on the farm. They worked out a soil conservation plan. The first thing Carl did was to take out all the fences. Contour strips were laid out and a 5-year crop rotation of corn-oats and 3 years of alfalfa-brome was started. During the first 3 years he put on 300 tons of limestone. He worked out a fertilizer program from soil tests made by the Wisconsin College of Agriculture. The corn is fertilized at planting time with 125 to 150 pounds of 5-20-20 as a starter. It is later side-dressed with 125 to 200 pounds of ammonium nitrate, depending on the need as shown by tests. Oats are fertilized according to test. Second and third year meadow is given 200 pounds of 0-9-27.

Gobrecht thinks that many people do not apply fertilizer to fit the needs of the land.

He feels that the heavy crops of organic matter resulting from rotation make heavier application of nitrogen necessary to feed the bacteria that break down this humus.

He does not rush through his farming operations but believes in taking his time and doing a good job. For example, he uses a field cultivator before plowing so that he can work the sod deeply into the soil before plowing. This makes more water soak into the soil, prevents the soil from sealing over, and provides for better capillary action in reverse during dry seasons.

Carl says he is convinced that a lot of people don't get the results they should from conservation practices like contouring and terracing because they don't pay enough heed to soil tilth. "You've got to have water-holding capacity in your soil in order to make contouring work, for example," he points out. "Soil management has to come before mechanical practices."

(Continued on page 120)

When The Bluestems Fade Away

By KENNETH T. SHERRILL

NATURE plays no favorites. She may adjust herself to man's activities, but in so doing she uses her own devices and quite often man must suffer the consequences.

Take the case of pastures in the Pottawatomie County (Kans.) Soil Conservation District. Pottawatomie County is in the northern end of the bluestem, or Flint Hill, pasture country. Originally this was some of the best native pastureland of the Nation. Sixty per cent of the farmland in the county is still classified as pasture. The bluestems and other tall grasses vie with each other for dominance. Monarchs through centuries of foul and fair weather, they have reigned supreme, crowding out most other forms of plant life. Grazed by the buffalo, seared by prairie fires, parched by sun and drought, they still laid down their green carpets each spring.

Civilized man and his influence over the last hundred years plus the hazards of weather have changed the native grass pastures in

Pottawatomie County, as in other counties of the bluestem region. The condition of many native pastures has gone down from good to fair and then to poor. Some of them can no longer be dignified by being called native grass. Some of them can no longer be recognized as pastures.

Pastures that at one time were in excellent condition now have practically everything in them but the "big four"—switchgrass, Indian grass, big bluestem, and little bluestem. These grasses are the ones that really produce the pounds of beef, which here is the desired end product of all grass.

Now taking the place of the tall grasses are the short perennials, such as bluegrama and buffalograss—grasses that are good in areas of lower rainfall, but out of place in the bluestem belt. But, in many pastures the shorter grasses, too, have had difficulty in surviving.

Continued abuse under unfavorable circumstances gives Nature's pride another blow. To fill the void left by these grasses, she pushes forward an invading horde of weeds, brush, and annual grasses—coralberry, sumac, ironweed, ragweed, cheatgrass, little barley—the scalawags of the native pasturelands.

Under poor grass management, the "big four" have been sacrificed and replaced by the short grasses and the annual grasses and weeds. What has brought this about? Grass, like all other plants, must manufacture its own food. It must supply its own needs and lay up some reserve in its roots if it is to continue to survive and furnish forage for livestock. Continually grazed short, it cannot do this and weakens and dies. Native grasses can fight the effects of drought and heavy grazing for a year and come back. But 2, 3, and 4 years of drought, plus overgrazing, causes the plants to lose their vigor and the sod begins to thin out. Other plants less productive for livestock begin to come in. Grazed even more closely, the tall

Note.—The author is work unit conservationist, Soil Conservation Service, Westmoreland, Kans.



Buckbrush and sumac on overgrazed pasture in Pottawatomie County, Kans.



Yearling cattle in one of the bluestem pastures of Mitchell Tessororf.

and short grasses give way to the annual grasses. Then, unpalatable weeds and brush rush in to take their places. Drought? Fire? Brush? Yes! But, still essentially a matter of too many livestock in the wrong place at the wrong time. This is why that 60 percent of the pastures in Pottawatomie County are now classified as fair to poor in condition.

As a contrast to these pastures in rundown condition, let's take a look at one of the better pastures. Among the pastures which might be rated excellent is that of Mitchell Tessororf of Onaga, Kans. This 320-acre pasture has been in the family for many years. Tessororf and his son, Don, have had control of the pasture since 1938. There is no brush in the pasture and the native grasses are giving good to excellent coverage.

Tessororf, former supervisor of the Pottawatomie County Soil Conservation District, stocks this pasture with approximately a hundred head of yearling steers each year. When he was asked how his pasture had been maintained in its present condition and kept free of brush, Tessororf hesitated in his answer. Proper rate of stocking and distribution of grazing appeared to have a lot to do with it. Mowing and the location of water and salt had helped in getting uniformity in grazing.

Did he think that the location of salt was important? "Oh, yes, I sure do." Salt had been used to attract the cattle over to the southwest corner of the pasture where grazing had been light. Mowing of certain areas had also helped to get more uniformity of grazing.

Had burning been practiced? "Well, only occasionally. We probably haven't burned the pasture more than once in 10 years." He was then asked if he thought his pasture was better than the average in this area. "Well, it must be for it is assessed at a higher rate."

Perhaps your pasture is one of the 6 out of 10 pastures in Pottawatomie County at which a second look must be taken to determine if it should be called a pasture. Or perhaps you have a poor pasture in some other area of the Bluestem Hills. If so, Soil Conservation Service technicians believe you should consider doing one, or several, of the following:

1. Provide supplementary pasture or feed so your cattle will not have to be turned out too early in the spring or need to stay on the pasture too long in the fall.
2. Be prepared to reduce the number of animal units on the pasture as a series of dry years come.
3. Consider pasture spraying not as a panacea for all of your pasture ills. Brush and weeds are indicators of a poorly managed pasture. Better leave them in there unless you have recognized their cause and are prepared to follow their removal with some of the pasture management practices that will prevent their return.
4. Question the practice of burning. Know that it has very little value as far as the control of brush and weeds are concerned, and that it does result in increased moisture losses and less forage production. Burning may result in a yearly loss of from 1,000 to 1,200 pounds per acre.

College Training for Soil Conservation

By WAYNE H. SCHOLTES

IOWA STATE COLLEGE is developing new methods in the field of soil conservation training. Two courses in agronomy, soil survey, and soil conservation are probably unique in the type of equipment and materials used. They were developed mainly by the author.

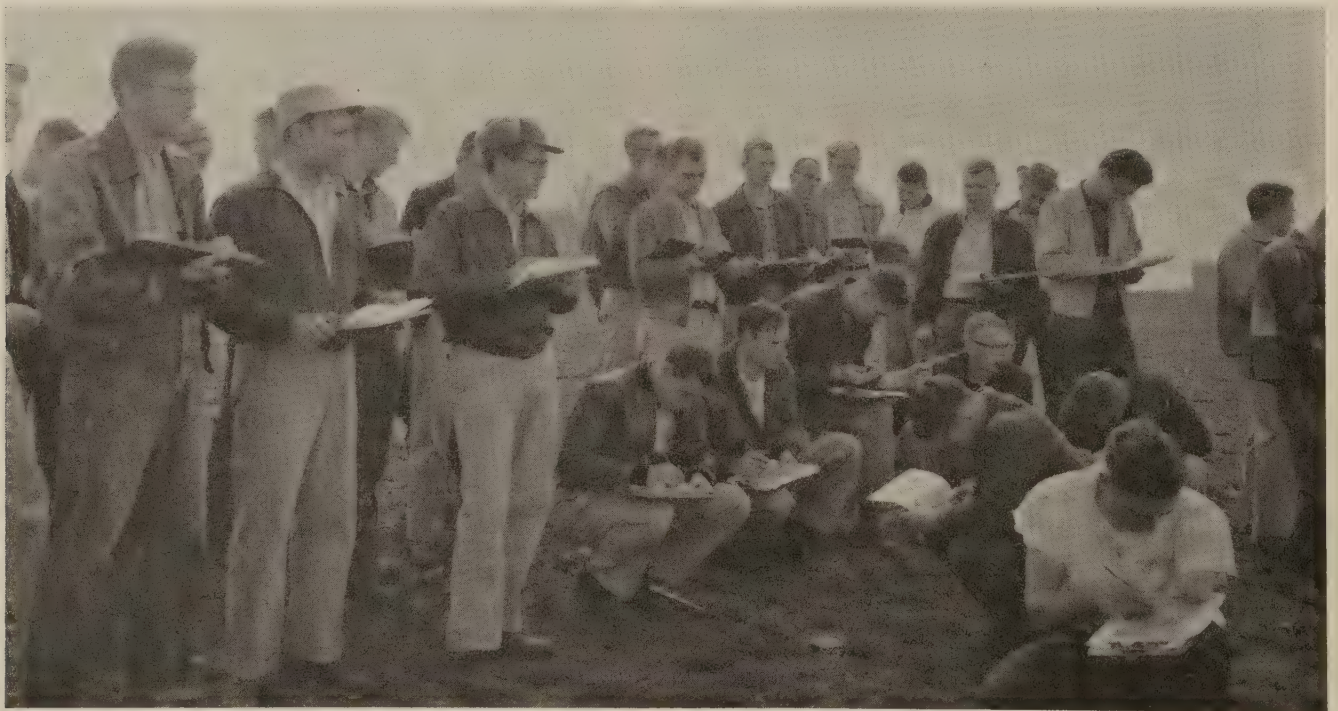
Intensive training of students in these courses required a large investment in new equipment, but this cost will be spread over a long period. The expenditure is making it possible to demonstrate many principles with modern precision instruments.

The main purpose of the soil survey courses is to acquaint students with the basic principles of soil formation and the field identification and

mapping of soils. Primary emphasis is placed on the relationship of Pleistocene geology to soil formation. Characteristics of soil parent materials and their influence on soil development are stressed. Geomorphology is covered in detail and the students observe three-dimensional projections of the topography made from field sheet photos in each of the major soil associations in Iowa.

The students attend lectures and prepare in the laboratory a set of interpretive maps from field sheets. Each student has a different field sheet showing soil, slope, and erosion on an aerial photo. From the field sheet data the student prepares a parent materials map, corn suitability map, erosion hazard map, and a land use capability map.

Note.—The author is professor of soils, agronomy department, Iowa State College, Ames, Iowa.



Students listening to a discussion on land features by SCS conservationist.



Professor Scholtes and student checking farm plan of student.

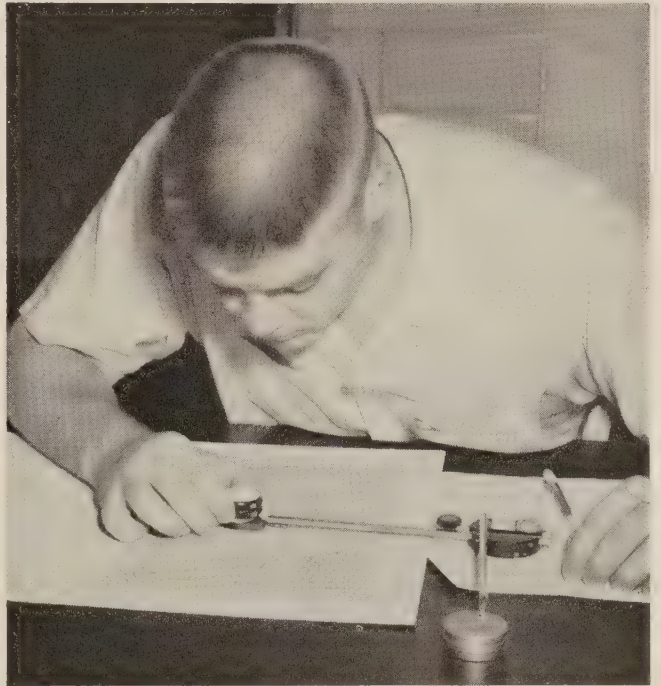
In conjunction with classroom study the students prepare, in the laboratory, a topographic map from individual stereoscopic photographs. Major slope breaks are mapped and the type of parent materials that would be found in such areas are recorded. Each student has a magnifying mirror stereoscope at his disposal. To familiarize each student with map measurement he must also measure the different areas on his map by use of the optical planimeter. In addition, a pair of air photos with the major land forms already identified are placed under a pair of scanner stereoscopes which are alined back to back. The instructor can view the topography in three dimensions with the student on the same photo pair and advise on any questions.



Students mapping geomorphological features through use of mirror stereoscopes and three-dimension viewing.

The next phase is intensive study of the soils in the surrounding area. Each student makes a complete set of miniature monoliths of the soils from soil pits dug in the field. The miniature monoliths are mounted, labeled, and sprayed with vinylite. After the monoliths have been treated, students make detailed profile descriptions utilizing Munsell color books and high power binocular microscopes for observation of structural characteristics.

At this point enough material has been used in classroom lectures on soil genesis that the first of two major field trips is scheduled. Each field trip covers about 700 miles. Travel is by charter bus, paid for by the students, and covers about half of the major soil associations in the State. Standard equipment is a portable sound



Student measuring map areas with optical planimeter.

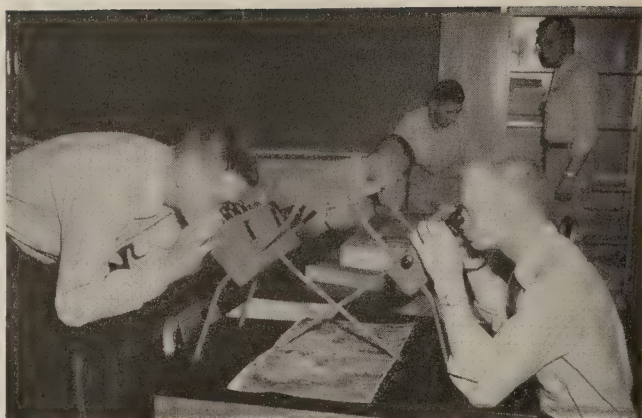
system for discussion enroute, portable black-board, spades, augers, and sample-sacks. Major profiles are sampled to illustrate the topo, chrono, geo, and bio sequences encountered in the field. At the end of the trip the samples are laid out, comparisons made, and the significant information summarized.

The second field trip is taken later, and the relationships, mapped earlier in the laboratory by the geomorphology, soil parent materials, and soil types, are studied and checked in the field.

Field trips are scheduled on weekends so that there is minimum disruption to the students' other classes.

The lecture and laboratory work culminates in a field mapping problem. A mapping legend is worked out in class to show soil, slope, and erosion. Each pair of students is supplied with field equipment and assigned a half section of land within 15 miles of the college. The air photo is on a larger scale than the field sheets to make possible detailed identification and recording of the soils. The photos for several flight lines are available to the students and they must determine the location of their tract and how to get there. Each student pair must contact owners of the tract, explain its mission and obtain permission to map the area. Farmers are very cooperative and often ask the students to check back with them on completion of the map so that they can learn more about the soils on their farms. Each team of students must match its soil boundaries in the field with the adjoining team.

Upon returning to the laboratory each student pair must ink its map, utilizing standard symbols, and then reduce this information to



Students observe land forms on maps with scanner stereoscopes.

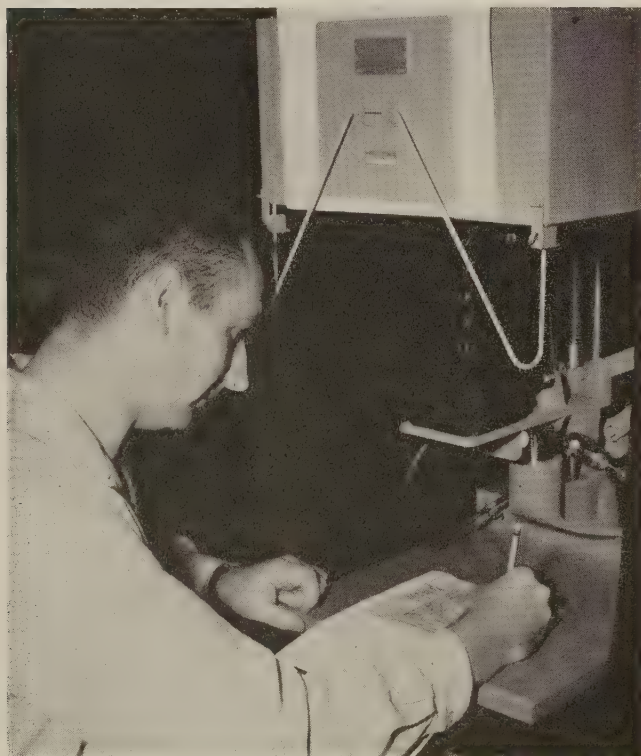
a publication-sized map. Maps are reduced in the overhead projectors to one-sixteenth of their former size. This necessitates elimination of many small areas and many combinations. These must be noted and reasons for all changes given.

The amount of work, study, and travel required for this course is much greater, in the students' opinion, than in any other course for which the same or more credit is allowed. However, its popularity is indicated by the fact that the course, which is elective, is always filled to capacity and has a sizable waiting list.

After the course in soil survey and classification, the soil conservation course follows in logical sequence. As with the classification course, a great deal of emphasis is placed on application of principles to actual field situations. The objective is the development of a workable farm plan with emphasis on maximum returns over the years.

Soil erosion is dealt with throughout the course on the basis of (1) what it is, (2) where it has occurred, (3) when it takes place, (4) why it has happened, (5) how serious it is, and (6) what can be done to control it. Bulletins, reprints of research papers, and experiment station reports are the main sources of data from which conclusions are reached.

In the laboratory the construction of contour maps from bench mark data is the first step in acquainting students with map construction. This is followed by laying out contour lines and making a topographic map. Next a bus is chartered for a 700-mile trip to a portion of the State where students can observe soil conservation in operation.



Student reducing field sheet map with overhead projector.

The soil conservation experimental farm near Clarinda, Iowa, where much of the original erosion data was obtained, is visited first. Students can observe the physical layout of the farm and discuss the results. From there the group goes to the Page County Soil Conservation District, where there is a full afternoon program under the direction of the Soil Conservation Service work unit conservationist. In this district the students visit farms where they see actual practices being applied to the land. The next day the group goes to northwest Iowa to see many conservation practices on two State experiment farms. The last afternoon on the trip is spent visiting some of the watershed flood control areas of the Little Sioux watershed. They see practices completed early in the program, and also those recently completed, and some in the process of construction.

By this time the students are ready to begin their farm plans. Three months before each quarter the instructor meets with Howard Oak, the SCS work unit conservationist in the Marshall County Soil Conservation District, to select a farm. Soil maps are studied and one is selected that has a variety of soil problems. A farm is chosen on which the operator has applied for a plan, but the farm has not yet been planned. The photo with the soil map is enlarged and reproduced and each student furnished a copy. In addition, soil test results are given for the farm. Students may work in pairs or individually on their term problems, which require the following: (1) Land use capability map, (2) erosion control practices map, (3) field layout and erosion control map, (4) fertilizer and lime program, (5) livestock program, (6) an estimate of production after farm plan is in operation, (7) total costs of the program, (8) estimated net annual income after the plan is in operation.

The group then meets with the farmer and Howard Oak. After a group discussion, the class walks over the entire farm, noting the condition of fences, physical layout, ridge divides and slope breaks for length of slope calculations, and checking the soil map for all drainageways.

The completion of the farm plan is a very time consuming and arduous job. However, the students place a great deal of value on this

training and think it is of great practical value. Some of the better plans are sent back to Oak, as the farmers are interested in seeing how the plans have worked out. It is interesting to note that the eventual farm plan made by the farmer with the planner's help is often similar to, or identical to, those made by the students.

LAND LEVELING PAYS.—Land leveling has increased the cotton yield 20 percent, cut irrigation time in half, and reduced irrigation labor two-thirds for A. L. Everett, who lives 6 miles southeast of Portales, N. Mex.

Before Everett's north field was leveled in the spring of 1955, there was excessive side fall in the land. He had to be working at irrigating all the time and used his shovel most of the time.

As Everett had been a cooperator with the Roosevelt Soil Conservation District since 1950, he took his irrigation problem to Soil Conservation Service technicians in the Portales office. The field was staked, surveyed, and after the various leveling designs were studied, it was decided to level the entire field to a uniform grade.

The plan chosen called for deep cuts exposing 2 or 3 acres of raw caliche. It was feared that these cuts would reduce the total crop yield for the field, which was almost 1¼ bales of cotton to an acre in 1954.

After Everett decided to level the field he spent \$1,700 on the 16-acre field, or \$106 per acre. He moved 10,650 cubic yards of soil and spread 160 tons of barnyard manure over the area where deep cuts were made.

The advantages of leveled land were soon apparent. Everett found he could irrigate 5 or 6 acres a day, where before he could irrigate only 3. He could set the water and do other farm work in the vicinity. Before leveling he could not leave the field while irrigating.

Although this saving of water, pumping costs, and labor was significant, the real payoff came in the fall when 11 acres of the field planted to cotton was harvested. In 1954, one of the best cotton years Portales has known, the field produced 680 pounds of lint to the acre. In 1955, Everett ginned 801 pounds per acre on the newly-leveled field. The cotton was sold for 31 cents a pound. This meant that about \$37.50 an acre was made due to more efficient irrigation. At this rate the total cost of leveling and fertilizing can be repaid in 3 years through increased crop yields alone.

When you consider the saving of water, saving in pumping costs, reduction in labor, increased crop yields, and the increased value of the farm property, it isn't difficult to understand why Everett is well pleased with the leveling and fertilizing practices on his farm.

—M. C. WILLIAMS

A Tireless Worker

By H. E. WALDROP

IN erosion-riddled Louisa County, Va., Russell (Russ) Fisher is trying to show others the way in conservation farming.

Severe erosion has been going on in the county for more than 300 years. If any county in the United States has suffered more total erosion, Fisher says he would like to know about it.

Crop yields dropped so low in Louisa County that around the turn of the century a call went to Washington, D. C., for help. The Department of Agriculture sent Hugh H. Bennett, then a soil surveyor, to investigate. He found that erosion was the main trouble.

No organized effort was made to combat erosion in Louisa County, however, for the next 30 years. Then, in 1939 Russ Fisher and a group of his neighbors organized the Thomas Jefferson Soil Conservation District. Carl Andrews, county agent, did most of the educational and leg work. District Agent Jim Quisenberry and other Extension people helped him.

Note.—The author is work unit conservationist, Soil Conservation Service, Louisa, Va.

The farmers of Louisa County elected Russ Fisher as their supervisor of the 3-county soil conservation district. The supervisors elected him chairman of the board. He has held that post since.

Russ runs a 1,000-acre grade-A dairy farm with his brother, C. F. Fisher, and their sons. The farm is located near Gordonsville.

Russ Fisher cultivates 300 acres in contour strips. He uses a 4-year rotation of corn, small grain, and 2 years of hay. Sod waterways protect depressions, furnish hay, and serve as roadways.

Corn yields of more than 100 bushels an acre are not unusual. Russ says that conservation farming has played its part in these high yields. Fifty years ago Bennett found that yields of 8 to 10 bushels an acre were average, while many yields were less.

By other good practices, before starting conservation farming, Russ had increased his average corn yields up to nearly 38 bushels per acre. The yields were above county and state averages in 1939 when Russ started level farm-



Part of the cattle herd graze near a pond on the Russ Fisher farm. Wild geese nest in the rushes on the far side of the pond.



Russ Fisher cultivating corn. The contour multiflora rose fence, in background, separates field from pasture.

ing to conserve water and fertility. Now he can sleep contentedly on dry or rainy nights, knowing that his soil will still be there for him and others to use again.

About 400 acres of improved pasture are yielding more and better grazing. Although the cows and sheep get some grazing all year, other forage has to be added for about 3 months each winter. This feeding period is about 4 to 6 weeks less now than it used to be. Each cow now averages 4 gallons of milk daily. The average used to be 3 gallons daily. In spite of this increased demand on pasture and meadow production, the number of dairy cattle has been increased 24 percent. And 25 beef cows have been added. Concentrates are bought to supplement the homegrown grains, hay, and silage. More than half of the 400 acres are now in native bluegrass, the rest has been seeded to orchardgrass, Kentucky 31 fescue, and ladino clover, or high producing annuals, such as sudangrass and rye.

Fisher finds that for top production an improved pasture must have: (1) Enough lime and fertilizer to satisfy plant needs; (2) annual clipping to keep weeds down; (3) rotated grazing to avoid overgrazing; and (4) seeding, on the contour where needed, to control erosion on long slopes.

Russ finds that his soils need about 2 tons

of lime per acre when he starts treatment. Also, about 1,000 pounds of complete fertilizer to supply the phosphorous and other minerals sold in the milk and used in making the bones of growing animals. He has found that he needs to add about half these amounts of lime and fertilizer each 2 or 3 years after the initial applications.

About 300 acres of woodland produce timber. Russ farms his woodland as carefully as his pasture. He has removed or killed defective trees and trees of poor species. He has planted seedlings in places where they have room to grow. He harvests timber on a selective basis: he cuts mature trees as needed, and leaves the young and thrifty trees to continue growing. He can harvest trees annually as a crop. By selective cutting he can remove from each acre annually about \$25 to \$35 worth of yellow pine logs on a sustained yield basis. Actually, of course, he finds it more convenient to harvest the trees by selective cutting about one-tenth of the woodland once every 10 years. Russ has been named "tree farmer" by Virginia Forests, Inc.



Fisher marking trees that are ready for harvest.



Hay harvest on the Fisher farm.

Russ Fisher has graded and seeded all old gullies on the 1,000-acre farm. He has installed tile drains in some wet areas. In other areas open ditches drain off excess water.

He has built four farm ponds. They furnish fresh, clear water for his cows. They also provide fish for his table, fire protection for his buildings, and recreation for the family. Wild ducks by the hundreds now use the ponds as a refuge.

Plantings for wildlife food and cover are many and varied. Wild geese now breed right on the Fisher farm. Russ has seen them nesting on the edge of two of his ponds. But, with his usual modesty, he gives most of the credit to his neighbor, Carl Nolting, who is quite an expert on wildlife.

Russ has removed, relocated, or rebuilt his fences to fit the conservation pattern of his farm. He uses multiflora rose hedges as fences and for wildlife cover. They also add to the scenic beauty of the farm. He thinks the rose fences protect wildlife from stray dogs and other predators.

Fisher has also planted wildlife seed plots to furnish seed free for his neighbors to use. He says: "I used to think ditchbanks and fence rows looked better cleaned up, but now I think they have more value as shelter and food

sources for birds and other wildlife." As a result, Russ figures the number of quail has doubled and rabbits are about 3 times as plentiful. He thinks deer have increased to at least 10 times as many as there were with his old system of farming. He gives credit to the Virginia Game Commission for much of these increases.

All this is a result of the vision Russ had of a better way of farming 17 years ago. His farm today is the fulfillment of a conservation plan he worked out with Soil Conservation Service technicians through the Thomas Jefferson Soil Conservation District, which he heads.

In addition to his farm and district duties, Russ is now a director for the Southeastern States in the National Association of Soil Conservation Districts. He's kept on the go, frequently to the Nation's Capital, to North Carolina, to other sections of Virginia, to the Deep South, to Boston for the week's national convention, or wherever duty calls.

Russ Fisher—tireless worker for soil and water conservation and practical conservation farmer.

There's no better Christmas gift than a subscription to this magazine.

Fifty Years Later

A Douglas-fir plantation sells for \$750 per acre 50 years after it was burned over.

By WILLIAM J. SAUERWEIN

WHEN Julius Mommsen transplanted wild Douglas-fir seedlings on his burned over timberland near McCleary, Wash., after the "dark day" burn of 1902, he probably did not realize how profitable it would be. Neither did his sons or his neighbors. After all, wasn't there enough timber to last forever? But, Julius undoubtedly had in mind a legacy for his 13 children.

One by one the children grew up and left the place, and old Julius died at the age of 81 in 1935, his ashes scattered through the beloved forest he had nurtured. Only John, the oldest boy, stayed on to run the 770-acre farm, 700 acres of which was by then thriving Douglas-fir and alder forest. The fir plantation was doing fine and needed little attention. Just keep fire out and let it grow was John's motto. He reneged a little during the early part of World War II, because the Nation needed long, straight Douglas-fir piling and Mommsens had them. He cut a few to help the cause.

Then in 1949 Henry Mommsen came home after 30 years of Alaska railroading. He and John started intensive management of the woods by first thinning 40 acres of Douglas-fir with the help and assistance of the local Soil Conservation Service men. That year the Port Blakely Mill Co., offered to buy out the Mommsens for \$54,000. John and Henry thought it was a lot of money, but they didn't need it, and they were having fun. They just kept on thinning and harvesting their timber.

The local SCS men encouraged them to thin and prune their 1931 plantation, then 23 years old. By 1955 the Mommsens had developed

roads and trails through the whole area, and thinned about 200 acres. That fall they got another offer, this time for more than \$200,000. Henry and John said they'd think about it, but after talking it over decided to keep the forest.

Then on Friday, April 13, 1956 *"The Oregonian"* of Portland carried this headline, "300 Acres Sold in Timber Deal." The story continued: "John and Henry Mommsen of McCleary, have sold 300 acres of the more than 800 acres they own to the Puget Sound Plywood Corporation of Tacoma for \$224,000. Until this sale, only selective logging has been done on the Mommsen tree farmlands, and most of it by the Mommsens themselves. Thousands of seedling have been set out over the years."

Imagine! Almost \$750 per acre for timber only half a century old!



Mommsen brothers tree farm near McCleary, Wash., (above) as it looked in 1910, (below) as it looked in 1950.



Note.—The author is woodland conservationist, Soil Conservation Service, Albany, Oreg.

DISTRICT PROFILE

HAROLD S. WRIGHT
of
NEW YORK

HAROLD S. WRIGHT of Pawling, N. Y., is surrounded by eminent people. Joining his Quaker Hill farm to the east is the estate of Lowell Thomas, to the south is former Governor Thomas E. Dewey, while Edward R. Murrow owns a farm nearby.

But Harold Wright is becoming a celebrity too, through his interest and activities in soil and water conservation. He is serving his second term as president of the New York State Association of Soil Conservation District Directors.

Wright has been instrumental in getting a request before the State Legislature to establish a subcommittee to study water rights legislation. He is 1 of 2 men representing agriculture on the subcommittee making a study of water use, water rights, and needed legislation that will affect all phases of the State's economy. Recently, he was appointed to a special legislative committee to study irrigation and water needs.

At the 1956 National Association of Soil

Conservation Districts Wright was elected Area I vice president. He was recently made chairman of the national association's publicity committee.

Harold Wright was educated in New York public schools. He studied agriculture at Colorado State College. He was manager of Sheffield Farms near Pawling for 25 years before buying his own farm on Quaker Hill in 1946.

While on the Sheffield Farms he came face to face with erosion problems. He noticed that a farm pond, used for harvesting ice, silted up from the hillsides above. After observing the effects of erosion for several years, and cleaning silt out of the pond, Wright decided it was time to do something about it. In 1938, he went to Art Williams, assistant agricultural agent in Dutchess County, who advised farming the land in contour strips. Some of the first contour strips in the county were laid out on Sheffield Farm that year. It was then that Wright became fully aware of the value and need of coordinated soil and water conservation measures.

When the Dutchess County Soil Conservation District was formed in 1946, Wright was one of the first farmers to request technical help. With Soil Conservation Service technicians, he devised a coordinated soil conservation plan. He has since established diversion ditches, contour stripcropping, wildlife hedges, crop rotations, rotation pastures, and tile drainage on his farm. He has reforested his wood areas. He reports that a coordinated conservation plan pays off handsomely in increased yields.

Wright has been a director of the Dutchess County Soil Conservation District since it was organized. He served as chairman for several years and is now district treasurer. Among his colleagues on the board of directors he is known as a man with new ideas and one who cuts through red tape to get things done.

Most farmers are busy on the farm trying to make ends meet, and Wright is no exception. Besides operating his own farm of 85 acres and 120 rented acres, he is building a new pole barn to replace the dairy barn that fire destroyed last winter. Despite all this farm work, Harold Wright still devotes a great deal of time to his soil conservation district and his state and national associations.

—HAROLD E. KLINGAMAN



Harold S. Wright.

Land Use Changes in the Southeast

By J. B. EARLE

ONE of the most significant agricultural developments of recent years is that of land use changes in the Southeast.

T. S. Buie, state conservationist for the Soil Conservation Service in South Carolina, sums it up this way: "A new crop has come to the South. Grass, once despised by Southern farmers as a devouring enemy, and fought by them from dawn to dusk, is now challenging cotton as the leading crop all the way from the Carolinas to Texas."

In 1926 the 9 Southern States east of Texas (Mississippi, Alabama, Georgia, South Carolina, North Carolina, Tennessee, Louisiana, Virginia, and Florida) planted 19,321,000 acres of cotton. Thirty years later the acreage in these same 9 States was down to 6,013,499. During the period 1925 to 1950, the area devoted to pasture and hay in the 9 States increased from 31,381,885 to 64,890,247 acres.

Note.—The author is area conservationist, Soil Conservation Service, Chester, S. C.



A typical grassland scene in Fairfield County, S. C.

Yes, land use has changed from cotton to grass and also to trees. Sixty-four percent of the land area of the Southeast is in forest. Commercial forest, excluding unproductive and reserved land, amounts to 91.6 million acres, an increase of 6 million acres since 1945. Most of this is accounted for by the abandonment of farmland. Farmers are, by far, the leading class of woodland owners, with nearly 55 million acres, about 60 percent of all the commercial forest.



R. H. Musser and S. D. Cathcart look at a thriving plantation of pines.

Some especially striking changes have taken place in agriculture in South Carolina during the past generation. For example, the peak in cotton acreage in South Carolina was in 1918 when slightly more than 2,750,000 acres were planted. The acreage in 1956 is about 726,000. The rate of change has been especially rapid during the past two decades.

The big changes have been from mules, manpower, row crops, and erosion to mechanization, electrification, grass crops, reforestation, diversification, and soil and water conservation.

Some of the factors contributing to the changes were: (1) Erosion was excessive when cotton was grown on land unsuited for row crops. (2) Research provided farmers with new grasses and legumes and more scientific methods of farming. (3) Agricultural agencies and farm leaders urged diversification, reforestation, increased fertilization, and conservation. (4) Increased industrialization in the South drew labor from the farm. (5) More and better

mechanical appliances were produced and distributed. (6) Demand for wood products increased. (7) Cotton and some other crops were overproduced and surpluses resulted in making acreage controls necessary.

The big change to conservation farming began in the thirties. Giving impetus to the change was the organization of soil conservation districts.

One of the best ways to grasp the significance of the changes in the South is to take a look at one former plantation where typical changes have come about. For example, on the Dave Crosby place in the Fairfield Soil Conservation District, loblolly pine is king, where once cotton reigned supreme.

At one time Crosby owned 3,000 acres of land, and in 1920 produced 750 bales of cotton, according to his grandson, John S. Stone of Chester, S. C. Now, only about 107 acres of cotton



Eroded field on the Dave Crosby place in Fairfield County, S. C.



Remains of the "Old Boarding House" on the Dave Crosby Place.

are planted. This is grown by six landowners who have purchased portions of the original estate.

When Crosby died the estate was split up. The original 3,000 acres is now owned by 8 farmers and a paper company.

The old Crosby Institute, the boarding house for the school, and cotton used to be the main features of this plantation. The institute building, the old boarding house, and a small acreage of cotton remain, but the changes that have come about are many.

Ed Davis, who has been farming some of the land since 1905 said, "People and cotton have been leaving during the last 50 years." Ed's 11 children are all gone except 2 who live nearby. They both work with pulpwood.

John S. Stone of Chester said, "As late as 1940 there were 200 people living on the Crosby tract of land. There are less than half that number living there now."

Except for the 107 acres of cotton now being grown and a small acreage of corn and small grain, the rest of the land is in pines, pastures, or idle. The amount of idle land is small and is fast being restocked naturally with pines.

There is one dairy farm on land formerly owned by Crosby. It is owned by J. O. Coleman. The 622-acre tract that he owns is used as follows: Pasture, 100 acres; cotton, 15 acres; corn, 20 acres; small grain, 45 acres; trees, 442 acres. Coleman also has four stock watering ponds that he built with technical help from the Soil Conservation Service.

His woods resulted from natural reforestation. He protects them from fire and thins selectively. A 15- to 20-acre field that was in cultivation about 20 years ago is now in pines. It was thinned recently and the pulpwood brought \$327.50. Mr. Coleman said, "There is at least four times as much pulpwood left in the stand as was removed. Then, too, the value will increase faster during the next 20 years than during the past 20."

"This part of the Fairfield County Soil Conservation District is better suited for pines or grass than anything else. There was a time when the situation called for cotton, but now pines and pastures are proper," he said.

Coleman says some of the reasons for the changes coming about are: (1) Some fields eroded so badly cotton could no longer be pro-



Left to right, M. R. Frierson, George B. Hagood, and R. Y. Palmer examine some pine seedlings that will soon be planted in Fairfield County.

duced; (2) the hilly land is not well adapted to use of machinery; (3) when this type of soil is clean tilled it can't do anything but wash away; (4) we couldn't compete with other sections in producing cotton; and (5) more industry came into the area and drew labor away from the farms.

He also said, "The changes were good for the people and the land. The people now have more income. The land is better protected. I predict that there won't be any cotton on this tract of land in one more generation."

Erosion and time cause land and homes to deteriorate unless properly maintained and conserved. The old boarding house on the Crosby tract of land is falling apart, but, thanks to pines and pastures, the land is being reclaimed and its strength renewed. A few more acres each year come under the powerful influence of young pine seedlings growing out of seed blown in naturally from nearby loblolly pines. This is proof that when given a chance, nature revegetates the land and heals over manmade scars.

Pastures and pines will never entirely replace cotton in the South. But they will fit together with cotton in a complementary relationship based on economic conditions, the capabilities of the land, the desires and abilities of the farmers, and related factors. There is plenty of land on which we can grow all of the cotton we need and still have millions of acres left for pastures and pines.

CONSERVATION TOUR FOR BIOLOGY STUDENTS.

—In May 1956, Limestone College biology students were taken on a field trip by their instructor Miss Barbara Manley and the supervisors of the Cherokee (S.C.) Soil Conservation District. Since then many students have written interesting articles about their tour. Excerpts from some of the papers follow.

The tour was an eye opener to Jean Spotts of Newberry and many of the others. "Last week my attitude toward conservation suddenly changed," she wrote, "I had never been on a tour of this kind before. In fact, I had never given too much thought to conservation. But now I find that conservation affects every part of our lives."

Martha Anne Floyd of Conway expressed it this way: "There were many things about our conservation tour that impressed me. While driving home this weekend I found myself watching the land and the way it was being used all the way home, something I had never done before."

The reaction of Ann Croom of Wilmington, N. C., was: "Since having gone on a conservation tour, I find myself automatically noticing the land and vegetation upon it. In contrast to eroded unproductive farms I see farms where all of the up-to-date conservation measures are practiced. Indeed, I breathe a sigh of relief when I realize that not all of South Carolina is washing away."

The sharing idea appealed to Mary Maner of Allendale: "Conservation is sharing. Sharing what we have today in natural resources with the generations of the future."

Beverly Timmons of Union says that she, for the first time, learned the facts of conservation. She wrote: "More important than any facts I learned, however, was that for the first time in my life I became aware that something had to be done now to conserve our water and soil, along with our other mineral and natural resources, if our Nation is to continue to prosper."

The pattern of conservation farming impressed Jo Ann Allen of Cherokee Falls: "The C. F. Swofford farm was really interesting—especially the stripcrop rotation. We flew over this farm during the spring holidays and it looked like a wide ribbon with many narrow stripes on it."

Frankie Sanders of Chester, probably remembering the drought of 1954 and her city's water dilemma, wrote of water: "Water can be converted from a destroyer of soil and plants to an aid to agriculture by terracing, use of grassed waterways, by drainage, pond construction, and irrigation systems."

Sylvia Cochran of Columbus, N. C. wrote: "I think there should be courses taught in all schools and colleges concerning the conserving of water and land and the best use of each."

Margaret Cudd of Mayo plugged SCS: "I have wondered why some streams are always muddier than others regardless of rainfall. Also, I know now why some farmers prosper more than others. When I ride along the highways now, I'll view the scenery with a different outlook. My respect for the Soil Conservation Service has reached a higher level."

Jackie Ray of Marion thinks progress is being made:

"More than ever before owners of land and operators of farms are becoming vitally interested in soil conservation."

Carol Knight of Summerville, one of the few farm girls on the tour, summed it up this way: "Since my dad operates a farm, the field trip was particularly interesting to me. I think he was a little impressed this weekend when I told him some of the things I had learned. My dad has his own conservation plan for our farm so I have always been aware of the importance of such a plan. But from this trip, I became, more than ever, aware of the need for a good soil conservation program."

—S. A. WOLFE

SUCCESSFUL FISHWAY.—The Fish and Wildlife Service announced recently that over 7,700 shad were passed upriver this year by the Holyoke fishway on the Connecticut River. This is the second year that substantial numbers of shad have ascended above the dam of the Holyoke Water Power Company. For 107 years previously the fish were denied access to a 30-mile stretch of their ancestral spawning grounds above this point.

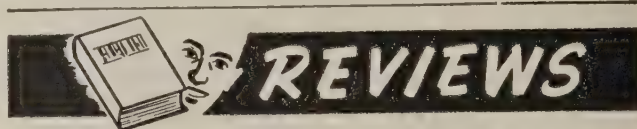
Earlier this year the Holyoke Water Power Company was awarded the Conservation Service Award of the Department of the Interior for its cooperation in developing the new fishway.

ACROSS THE SEA TO SUCCESS

(Continued from page 105)

He also believes that a complete farm conservation plan is basic and that it should be followed regardless of crop failures and other interruptions. He has learned from experience that you get nowhere by having a plan and then failing to follow it.

The buildings on the new farm were in poor condition and are located in one corner of the farm. Carl and Dick already have a good start on remodeling the house and plan on building a milk house soon. "The building of a new barn will have to wait until it can be paid for out of the earnings of the farm," Carl said.



FORAGE CORPS. By Gilbert H. Ahlgren. 2d edition. 536 pp. Illustrated. 1956. New York: McGraw-Hill Book Co., Inc. \$7.

THIS book is well written and reflects Dr. Ahlgren's experience in teaching and research. It is broader in scope than the original edition. Over a hundred pages of new material has been added, either as new subject matter, or enlargements on the original information. New chapters include pasture and range management, conservation cropping, weed control, and forage mechanization.

The book clearly and concisely presents the basic principles of forage production. Important legumes and grasses are well treated, including adaptation, use, and management. Tables are effectively used to explain recent research findings. The author has cited many new references on the various phases of forage crop production as evidenced by the list of references at the end of each chapter.

The several chapters devoted to subjects common to all forages, includes seeding methods, seed mixtures, hay, silage, mineral nutrition, and seed production. These have been substantially enlarged and contain new material that was not available when the first edition was published in 1949.

The first few chapters dealing with the history, production, and use of forages, as well as the effect of soils and climate on the different species contain much more valuable information than the original edition.

This book will be valuable as a reference for agricultural workers, and is written in such a manner as to be useful as a college textbook. It should be especially useful to those east of the Rocky Mountains.

—B. D. BLAKELY

JANUARY 1957



Soil Conservation

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION.

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SECRETARY OF AGRICULTURE

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ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

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SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 18, 1955. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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TREE FARMING.—The American Tree Farm System of growing timber as a crop on private lands gained nearly 2 million acres during the first half of 1956, according to figures announced by American Forest Products Industries. Certified Tree Farm acreage in 43 participating States now totals nearly 40 million acres.

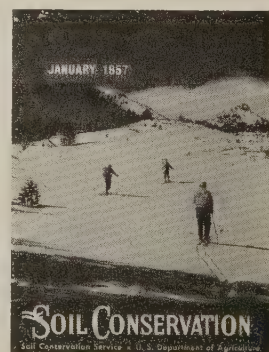
The Tree Farm program is an industry-sponsored movement to recognize private landowners who voluntarily protect their woodlands from fire, insects, disease, and destructive grazing and who harvest for repeated crops.

Georgia, with 3,795,743 acres, retains national leadership, followed closely by Florida with 3,603,014 acres; Alabama, 3,558,242 acres; Oregon, 3,524,931 acres; Texas, 3,389,881 acres; Arkansas, 3,372,423 acres; and Washington, 3,322,994 acres.

Mississippi leads in the number of certified Tree Farms: 910. Texas is second with 831, and Alabama third with 663.

Three more States launched the Tree Farm program during the first half of this year—Vermont, Connecticut, and New York.

Editors are invited to reprint material originating in this magazine.



FRONT COVER.—Snow surveyors on their way to the next snow marker to make further measurements of the winter snow pack.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Soil Maps For All Users

By F. M. ORSINI

A new kind of soil map will soon appear in the series of soil survey reports as a result of the combined efforts of the Department of Agriculture and State agencies working together on the National Cooperative Soil Survey. These maps will have an aerial photo-mosaic background with soil boundaries and symbols overprinted in red. The scale of most of the detailed maps will be 1:20,000 (3.17"=1 mile) with sheets 11½" x 15", which, when folded and bound into the report, will produce

an atlas 9¼" x 11½". Each atlas will also contain a small-scale colored soil association map of the area.

Mapping of soils in the United States began in 1899. This continuing program has provided published maps for approximately 1,700 areas during the last 57 years. The majority are now 25 or 30 years old and, therefore, represent what was known about the soils a quarter of a century or more ago. The general scale of the early soil maps was 1"=1 mile, and in most cases they were printed on large and often unwieldy sheets.

Note.—The author is director of the cartographic division, Soil Conservation Service, Washington, D. C.



New type soil survey maps in pamphlet form are displayed above old type soil survey map.

In recent years there has been an increasing demand for larger-scale maps from which one can read accurately, in relation to local land lines, the kinds of soil in specific fields. Such maps are required for a variety of uses: farm and ranch planning in soil conservation districts, research and education programs of the Department and the State colleges, planning the agricultural phase of such programs as the Tennessee Valley Authority and the Bureau of Reclamation, tax assessment, predicting engineering problems on new highway construction, and the location of certain road building materials such as gravel, sand, and clay. For many other activities such as the Soil Bank, the Great Plains program, and the Agricultural Conservation Program, detailed soil maps are needed on which individual fields may be recognized clearly.

To meet these demands, the cartographic division of the Soil Conservation Service made a comprehensive study about 2 years ago of the economics of producing maps of sufficiently large scale to meet the needs of all of these users. It was found that larger-scale maps with an aerial photographic mosaic background could be produced by modern cartographic methods for considerably less than the old type, smaller-scale, colored maps. By using an aerial mosaic much drafting was eliminated, and at the same time a greater amount of background detail was included. The aerial mosaic shows such details as field boundaries, broad land use, minor roads or trails, and many others that could not be shown on a line base map.

It was recognized that as cultural and land use changes occur the aerial mosaic will not agree exactly with existing conditions. However, if this is clearly understood by users, the location of individual fields should still be as easy, or easier, than with the old type line maps, especially in those parts of the country that do not have regular section lines. We also were aware that it would not be as easy to get a view of the whole county with this new atlas type map as with the old line maps, but this objection was more than balanced by the awkwardness of the large sheets for use in the field. By including in the soil survey report a colored soil association map, generalized from the detailed maps, we have in some measure provided

a picture of the county as a whole with the colors distinguishing the outstandingly unlike soil boundaries.

A sample soil map for a county incorporating these innovations was produced and reviewed in the Department, in the Land Grant colleges, and by a large group of soil map users. We found that nearly all map users preferred soil maps on sheets small enough to be folded and bound in book form. We had presumed that this new type map would have its greatest advantage in areas that are not sectionalized, yet we found that users in the Midwest preferred it to the old line maps even though location is fairly easy to establish on them. The Soil Conservation Service has adopted the new type map as standard. And the production program of this new type soil survey report is now well underway.

It takes from 12 to 20 months for any one map to travel the cartographic production line from mosaic construction, through manuscript compilation and map finishing, to final lithography. Thus, only a few such maps will be released during the next year. Watauga County, N. C.; Houston County, Tenn.; Brazos County, Tex.; and Pasquotank County, N. C., will be among the first to come off the presses.

The map construction techniques now being used include some interesting innovations in map making. The first step involves the preparation of controlled aerial mosaics through photogrammetric methods. Plastic sheets coated with an opaque white scribing surface are sensitized and the photomosaic image superimposed thereon in green dye. The soil survey detail is transferred to these green-coated sheets from the original soil survey sheets by the use of vertical reflecting projectors, or by tracing over a light table. Everything to be transferred that appears on the original soil survey sheets is scribed or etched in rough form on these green-coated manuscript sheets. Wherever a line has been scribed the opaque coating has been etched out leaving a clear line. Scribing is a relatively new development in map finishing that substitutes for fine line ink drafting.

The manuscript map is then adjusted for changes brought about by the soil correlation and is then edited. From these scribed manu-



Section of a new type soil survey map; scale, 1: 20,000.

scripts an image of the culture, drainage, and the soil survey delineations is printed on a yellow-coated plastic sheet for each of the colors that will be printed on the final map. Generally, on the published maps the culture and drainage will be printed in black, and the soil delineations and symbols in red, over the mosaic background. Thus, on one of the yellow sheets only the culture and drainage is scribed in finished form. On another one, only the soil delineations are scribed. These scribed sheets are used by the lithographers as negatives from which press plates are made.

The lettering and some of the more complex soil symbols are placed on separate, clear plastic sheets in exact registration with the final scribed yellow-coated sheets, so that they do not conflict with scribed lines or with lettering to be printed in black. A separate lettering sheet is made for those items printed in black and another one for those soil symbols printed in red. To insure uniformly high quality lettering, preprinted lettering with an adhesive backing is now used for this purpose. In order

to keep the lettering costs low, a letter scribing instrument will be used to scribe the lettering directly on the final scribed yellow-coated sheets and reduce or eliminate the use of the more expensive preprinted lettering.

After editing, the negatives of the lettering layouts, the halftone negatives of the aerial mosaic, together with the scribed yellow-coated color separation sheets, are turned over to the lithographers for printing of the finished maps.

These modern large-scale soil maps permit publication of practically all of the detail mapped by the field surveyor, so we can transmit to all users the very latest scientific knowledge of the soil of a given area. The accompanying printed reports explain in detail the characteristics of the soils, and outline the alternative combinations of practices for the adapted crops, and the consequences of these practices on both crop production and the longtime productivity of the soil.

*There is no better contest prize than
a subscription to this magazine.*

How Does Vegetation Affect Water Yield?

By GEORGE W. MUSGRAVE

THE great interest in watershed treatment and water as a basic necessity has intensified a technical question that has been growing steadily in recent years. If the vegetation on a watershed is changed, how will it affect the yield of water from that watershed? Some say the effects will be great; others that there will be virtually no effect; and many others take positions in between these extremes. In areas where water shortages are common, the question is of great importance.

This controversy, of course, stems from the fact that there are little experimental data today that apply directly to the problem. When we think of the wide difference between conditions in the humid East and the arid West, the complexity of the innumerable relations between climate, kinds of vegetation, and both water needs and supplies becomes apparent. Water yields differ with the seasons and differ with the soils, slopes, and other characteristics of the watersheds. Complete studies of these specific problems are indeed scattered and almost nonexistent.

Possibly the difference of opinion traces back in part to a famous classical study that actually was never intended to apply to this problem. This highly regarded study by Briggs and Shantz on the water requirements of plants was planned to find out how different kinds of plants differed in their use of water. Accordingly, the plants were grown in containers of soil, well watered and with the surface of the soil sealed against evaporation. Thus, escaping water in the form of vapor necessarily came from the plants—and none of it directly from the soil. The experiment showed that much more water was needed to produce a pound of dry matter in some kinds of plants than in others. It also showed that even where direct evaporation from soil was prevented, the water

requirement of Grimm alfalfa, for example, was higher in those years when evaporation from a free water surface was higher.

That is to say, the daily and monthly rates vary with sunshine and temperature, amount of vapor in the air, and the amount of wind movement, whatever the type of vegetation.

Existing data also show a close relationship between the march of the sun and rate of water use. On days of normal weather the peak usage occurs a little after noon, or when the sunlight is near its daily maximum. Seasonally the peak usage occurs soon after June 21, or soon after the sun reaches its seasonal maximum.

Clearly, climate plays a big part in determining the amount of water used by plants.

But our watershed problems involve much more than use of water by plants. The yield of water is affected by other abstractions from precipitation, such as evaporation from soil and additions to deep-seated ground water. As one rancher expressed it recently, "Any fool knows that a tree uses more water than that thin grass cover, but the bare soil itself loses water too."

Here is an aspect of the problem that deserves more consideration than it usually receives. Suppose that on one watershed there is dense vegetation with little bare soil exposed to sun and wind. On an adjacent similar watershed there is sparse vegetation and much bare soil exposed to evaporative forces. Let us assume that the dense cover of plants uses more water than the scattered vegetation. That is, the transpiration or movement through the plants is greater in total when more plants are present (provided sufficient moisture is present to meet the demand for it). Surely that does not necessarily mean that the total of transpiration *plus* soil evaporation is greater where the vegetation is more dense. Obviously, evaporation from the unshaded, unprotected soil is greater than the direct evaporation from the soil beneath the dense vegetation.

Note.—The author is staff specialist (infiltration), engineering division, Soil Conservation Service, Washington, D. C.

When we compute the vapor losses from the watershed with dense vegetation, we add to large transpiration losses a small amount of evaporation. On the other watershed we add to a large soil evaporation a small amount of transpiration. Thus, the water requirements of either type of vegetation are no positive indication of the *total losses* of moisture from the watershed. Nevertheless there has been more than one instance where such assumptions have been made. The comparisons of different kinds of vegetation reported by Briggs and Shantz, sometimes have tacitly been assumed to specifically apply to the *total losses* from watersheds rather than that lost solely through vegetation.

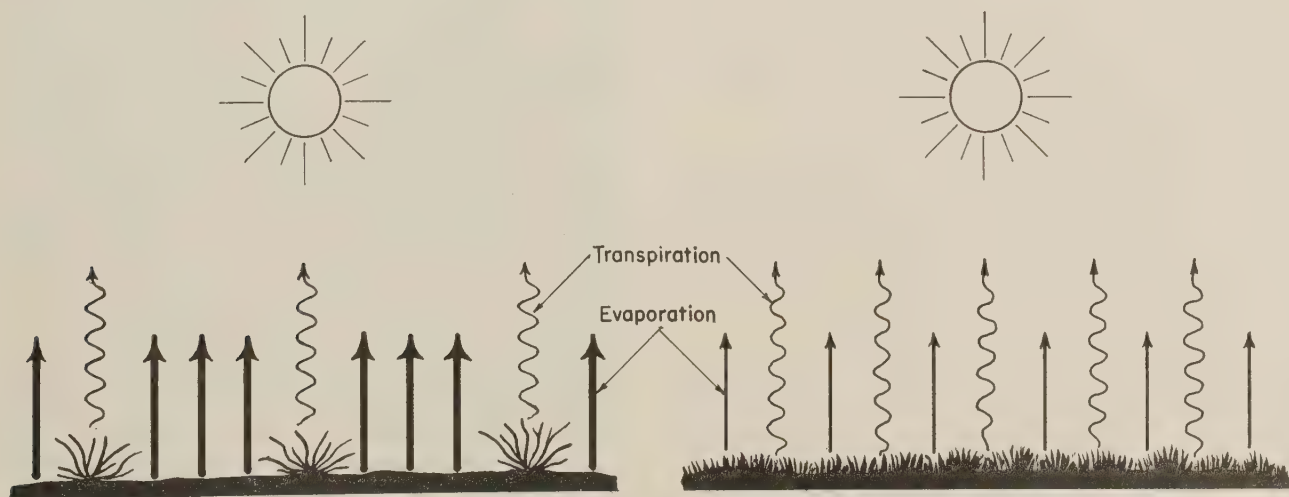
It is often pointed out that the roots of plants can withdraw water from soil depths greater than can evaporative forces acting upon bare soil. This quite likely is true for those times when the moisture levels are higher beneath the vegetation. Once this water has been withdrawn by plant roots, can we expect much difference between vegetated and bare areas or densely and sparsely vegetated areas? If not, then we could expect that any appreciable difference, in areas of low rainfall, would be limited to relatively small portions of the year.

One of the most important facts that affect the amount of vapor losses from watersheds, but one often overlooked, is the amount of moisture that is present in the soil. On very moist soils evaporation is higher than on drier

soil, as is attested by many experiments. Also, the amount of water passing through plants when soil is moist is greater than under dry conditions—all other things being equal. Existing data on depletion rates of soil moisture under different kinds of vegetation on relatively dry uplands bring out a principle that is generally applicable. These data show that differences between dense and sparse vegetation in their depletion rates are wider when the soil is moist. At lower moisture levels the difference is small, while at very low moisture contents there is no difference at all. Apparently, at low levels of available moisture even very sparse vegetation can use all of the water that is present.

Although there is very little direct evidence on the yield of water from watersheds having different densities of vegetation, there are some fairly well established principles that cannot be ignored:

- (1) The annual total runoff, being a residue after certain abstractions from total precipitation, varies with both the amount and kind of precipitation and the amount and kind of abstractions—as to ground water, direct evaporation from water surfaces, and so on. The combined evaporation and transpiration (which has come to be called *evapotranspiration*) usually comprises the bulk of these losses. Since on any given site evaporation is higher than transpiration under sparse cover, while



How does the sum of evaporation from the soil, plus transpiration from plants, compare from ground with sparse vegetation to ground with dense vegetation? The drawing to the left illustrates possible happenings where sparse vegetation exists, while that to the right represents ground covered with dense vegetation.

under dense cover transpiration is higher but evaporation from soil is lower, it is apparent that no great difference in the sum of the two variables is to be expected.

- (2) Since the differences in evapotranspiration for watersheds of differing cover density vary with the prevailing content of soil moisture, the application of consumptive use formulae derived largely from irrigated lands (i.e., high moisture-content areas) can scarcely be expected to apply to upland dry-farming conditions.
- (3) The very great effect of climate on the yield of water is known but not always recognized. Large yields of water almost invariably come from areas of high precipitation, and especially of snowfall. Low yields occur under high temperatures, both annually and seasonally.

These are some of the things that affect water yield but are not always included in making evaluations of it. Even when we recognize these phases, we still do not have the means of making a precise numerical estimate of either water yield or evapotranspiration. We are, however, in a better position to see the directions of trend and to make closer evaluations than otherwise would be possible. Because of the real practical importance of the problem, we need to make the best possible evaluations and we need considerably more research on each phase of it.

MICE CONTROL.—A new and cheaper way to control mice in orchards was demonstrated in Wisconsin during September. The new control is based on the fact that mice will avoid trees lacking in grass cover around the trunks.

University of Wisconsin research workers L. G. Holm and F. A. Gilbert found a selective herbicide that kills all vegetation in a radius 3 feet from the trunk, leaving the ground barren. After 4 years' tests, no injury has occurred to the trees either as a result of mice or the herbicide.

Two teaspoons of the chemical, CMU, are mixed in two gallons of water and applied evenly with a sprinkling can around the trunk. The researchers used 10 pounds to the acre and say the material should be applied preferably before July 1 to control vegetation.

The researchers issue one warning. The chemical should be applied only around bearing apple trees. Younger trees may be damaged.

Double Duty Stubble

By CALVIN WIXOM

HE is not known as a particularly stingy sort of person, but Delwin "Bus" Theisen is a miser with his grain stubble. First he uses it to produce a crop of wheat, and then again to keep his topsoil on top of his own land.

"I don't set myself up as an authority on stubble mulch farming," Theisen says, "and I would not try to tell my neighbors how to run their farms. But I know what I have found out on my own farm. And there was one of my neighbors who came over once to look at my summer fallow and was surprised to find that I had stored more moisture than he had in his fallow.

"Then there was the time when I was just starting out with this trashy fallow idea. My Dad had a field just up the slope from one of mine. Runoff water from his field flowed

Note.—The author is work unit conservationist, Soil Conservation Service, Bozeman, Mont.



Oats growing in stubble mulch on Theisen farm.



Del Theisen stands by his tool bar equipped with chisels, while his son, Malcolm, kneels by the rod weeder.

onto my land. Dad was a good farmer in the days when clean, black fallow was something to be proud of. He is a believer in stubble mulch tillage now, but at that time he didn't like it and told me so. My brother, Cliff, is running the old place now and he is a stubble mulcher. But, to get back to this year I was telling you about when I had mulch on my field and Dad's was black. When the snow melted that spring the water and mud from Dad's field came down onto mine a little way and stopped. The stubble held my own runoff and his too."

Theisen's 680-acre wheat farm is located in the Gallatin Valley of Montana. Wind erosion is not much of a problem, but the spring runoff from melting snow sometimes causes excessive rill erosion on slopes and gullying in the waterways. Most of his cropland falls in land capability class III, due to slopes of 5 to 9 percent. He follows a simple crop-fallow rotation. The stubble is left undisturbed after harvest until the spring of the following year. His normal procedure is to use an offset disk or flexible tiller for the first operation, and then follow up with duckfoot shovels or a rod weeder. Bus has found that the duckfoot shovels will do a good job of killing weeds when his soil is too damp for the use of the rod weeder. He now plans to experiment with chisel points for the first operation in an effort to hold more of the stubble in, and on, the surface soil.

Seeding the new crop through stubble mulch

became somewhat of a problem until Theisen purchased one of the new furrow opener type drills. This drill has shovels to open furrows for the seed. The seeds are dropped in ribbon-like rows 4 inches wide. The rows are 14 inches apart from center to center. Bus says he worried some at first about having these drill furrows on his sloping fields. His slopes are of such an irregular pattern that drilling on a strict contour is not possible. He has found, however, that each furrow carries its own share of runoff, and that the combination of individual furrows and the stubble incorporated into the soil does an excellent job of retarding erosion and leading the water into the soil.

"I used to think that deep tillage was necessary, too," he says, "I would put those chisel points down as deep as 12 inches in the belief that I was creating more moisture storage capacity. Now I am convinced that such deep tillage is a waste of power and may even cause a loss of stored moisture. I think the secret is at, or near, the surface of the ground. The problem is to get the water through the surface without soil sealing and runoff. Now I only run my equipment deep enough to keep it operating smoothly and to kill weeds, although I do sometimes put the chisels down a little deeper to break the hard sole caused by the rod weeder."

(Continued on page 131)

Keeping Grasslands Productive

By R. R. ROBINSON

No. 19

This is the nineteenth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

GRASSLANDS usually are highly productive as long as good stands of adapted legumes are maintained. Therefore, even on soils not well adapted to legumes, it is desirable to include legumes in the original seeding and to fertilize and manage the crop to maintain the legumes as long as possible.

Fertilizers for good grass-legume mixtures usually consist primarily of phosphorous and potassium. However, the behavior of these two elements, both in the soil and the plant, are very different. Most soils will fix large quantities of phosphorus in forms not readily available to the plants. Potassium fixation, however, is not an important problem in most soils. Forage crops normally will remove from the soil about 110 pounds of potassium, but only about 15 pounds of phosphorus per acre per year. With heavy rates of potash fertilization, the potassium removal by the crop may be doubled. This luxury consumption of potassium is undesirable because it depletes the soil of potash without adding to the value of the crop.

Note.—The author is soil scientist, soil and water conservation research branch, Agricultural Research Service, Beltsville, Md.



Well managed whiteclover-Bahia grass pasture.

Luxury consumption of phosphorus on the other hand is no problem. In the first place, the plant will not absorb excessive quantities of phosphorus; and secondly, a moderate increase in phosphorus content of the herbage insures an adequate level of phosphorus for the high producing dairy cow. Thus, liberal quantities of phosphorus are recommended at the time of seeding, particularly on soils that have not been adequately fertilized in the past.

Liberal quantities of potassium are equally important, but because of luxury consumption, potassium should be applied once or twice per year, depending upon the soil and the total yields produced. Soils that are low in available potassium and require high rates of potash fertilization obviously are the ones on which potash should be applied most frequently.

Legumes are particularly susceptible to potassium deficiencies in grass-legume mixtures because the grasses are strong competitors for potassium, and when the supply becomes limited, the legumes are the first to suffer. Fortunately, legumes show easily recognizable symptoms of potassium deficiency characterized by white spots along the margin of the leaves, followed by yellowing of the leaf margins, and eventually the entire leaf. By periodic inspections of fields, it often is possible to detect potassium deficiencies and apply additional fertilizer in time to save the legumes.

The interaction between potassium nutrition of the plant and bacterial wilt of alfalfa furnishes a further clue to the potassium status of the soil. Bacterial wilt partially clogs the roots and interferes with absorption of nutrients. Plants infected with bacterial wilt may show potassium deficiency symptoms when the level of available potassium is adequate for normal plants. If infected plants do not show potassium deficiency symptoms, it may be concluded that potassium fertilization is not yet needed.

Grazing and cutting practices are a major factor affecting persistence of good stands of legumes in grasslands. Following clipping, all forage crops draw upon stored food reserves in starting new growth. As the plants recover from clipping, the reserves are replenished. The various grasses and legumes differ widely in

storage of reserves, extent of depletion following clipping, and rate of recovery.

Alfalfa is particularly susceptible to injury due to depletion of reserves if clipped too frequently. The reserves of alfalfa are stored in the roots, but are depleted rapidly following clipping and are not fully replaced until about the time the plants start to flower. If one persists in clipping more frequently, stands of alfalfa cannot be maintained.

The reserve cycle in ladino clover is entirely different from that of alfalfa. The stem of ladino clover grows flat along the ground and a leaf develops at each node. When growing with a vigorous grass, each new leaf arises in rather dense shade and elongates in an attempt to reach light. This type of growth tends to deplete the reserves of the clover, and if grazing or cutting is delayed too long the clover will become weak and may be lost. Also highly significant, is the fact that ladino clover stores carbohydrate reserves in the prostrate stems, or stolons, whereas the grasses store a large part of the carbohydrates reserves in the stubble, or lower part of the stem. Thus, close clipping or grazing will actually remove part of the reserves of grasses, but not of ladino clover. In fact, frequent clipping is necessary to maintain ladino clover in association with a vigorous grass. A general guide, therefore, is that the poorer the stand of ladino clover, the more frequently it should be grazed.

DOUBLE DUTY STUBBLE

(Continued from page 129)

Theisen was already experimenting with tillage for the control of erosion at the time he applied to the Gallatin Valley Soil Conservation District for technical assistance, and a conservation plan, in 1951. Since that time he has gained valuable experience and has been very cooperative with the district and the technicians of the Soil Conservation Service.

"I don't make any claim of increased yield," he says. "In fact, stubble mulch fallow might cost a few bushels. But, I am keeping my soil at home, and total yields over the years ahead should more than make up the difference."

Canyons Converted to Grassland

Western Iowa farmers spend as much as \$300 per acre to convert huge gullies into usable grass waterways.

By **GEORGE HOLMBERG, RICHARD L. PHILLIPS, and VERLE M. ARNOLD**

WESTERN Iowa is a land of rolling loess hills. Most of the soil is a silt loam, is very porous, and produces bumper crops. But, it washes away like sugar in heavy rains if not protected with a cover of grass or legumes.

The pioneers who settled this area found the rolling hills covered by a sea of waving grasses. But when the valleys and hills alike succumbed to the plow, not only did the soil wash from the slopes but great gashes were cut in the valleys—gullies 50 to 100 feet wide and 20 to 40 feet deep.

It was these canyons that caused the technicians of the Soil Conservation Service to scratch

their heads. Twenty years of experience had brought the answer to a lot of questions. But only in the last few years has headway been made in changing these huge, raw gullies into grassed waterways.

One example of what can be done with these gullies is on the E. H. Harms farm near Underwood in Pottawattamie County. Prior to 1944, one gully 30 feet deep and 80 feet wide had developed on the Harms farm. Trees had been planted but did not provide adequate control.

In 1943 and 1944, several earthen dams were constructed in the gully. A total of 344 acres drained into the gully at the point where it left the Harms farm. The drainage area includes all or parts of three farms, the operators of which are cooperators with the West Pottawat-

Note.—The authors, all of the Soil Conservation Service are, respectively, agronomy specialist, Sioux City, Iowa, area engineer, and work unit conservationist, Council Bluffs, Iowa.



Grass waterway on the Ernest Harms farm near Underwood, Iowa.

tamie Soil Conservation District. The ridge areas of all of the farms were terraced. By 1946 these earthen dams had collected considerable silt and it was apparent that they had outlived their purpose. It was decided that the most feasible solution now was to clear the trees, slope the banks, shape, and establish a grassed waterway.

In 1946 and 1947, Harms proceeded with his waterway project. He built a parabolic shaped waterway with a top width varying from 50 to 100 feet. The grade of the waterway averages 1 and 1½ percent and was designed for velocities of 5 feet per second. A drop inlet structure was built at the lower end to provide an outlet for the waterway. The waterway was heavily fertilized with manure and commercial fertilizer, and seeded to brome grass and reed canarygrass. Some sodding of reed canarygrass also was done.

In 1947, a wet year, it was found necessary to tile the waterway to hold the vegetation. Since that time the waterway has functioned satisfactorily with little maintenance. Harms has reclaimed 10 acres of gullied area into usable hay or pastureland at a cost of approximately \$300 per acre, as well as enhancing the beauty and value of his farm.

Bruce Baker, a cooperator with the West Pottawattamie Soil Conservation District, purchased a steep, hilly 160-acre farm near Council Bluffs, Iowa, in 1948. The hill land averaged from 19 to 25 percent slope and was cut up by 3 large gullies. In 1949, Baker started his terrace program and by 1953 had built 4 miles of terraces on these steep slopes.

Baker hired a local contractor with a bulldozer to blade in one of the smaller gullies in October 1951. The construction of this waterway involved moving approximately 9,000 cubic yards of earth. By 1953, Baker felt it was necessary to do something about the large gully that was bisecting his farm. It was not only destroying valuable land but was a menace to livestock. In fact, he had lost several head of cattle in the gully. Upon recommendation of local Soil Conservation Service technicians, Baker decided to work the gully into a grassed waterway. This gully drained only 32 acres, yet it was 1,800 feet long, was from 50 to 130 feet wide, and 20 to 48 feet deep.



Gully on the Bruce P. Baker farm near Council Bluffs, Iowa (above) before treatment, (below) after treatment and seeding to grass.



With technical assistance from local SCS technicians, Baker constructed a waterway designed for 4 feet per second velocity. The grade was divided into 3 sections using 9 percent slope at the top, 7 percent slope in the middle, and 4 percent slope at the bottom. The waterway averaged 40 feet in width. It emptied into a county road ditch which made a drop inlet stabilizing structure at the outlet necessary for safe discharge. It took 41,000 cubic yards of soil to fill the gully at a cost of \$2,400 plus \$700 for the structure, seeding, and fertilizing. Now, Baker has a beautiful grassed waterway in his pasture, with 5 acres of usable land, and the deathtrap for his livestock gone.

A complete soil and moisture conservation program is being carried out on the John Hanigan farm, located 2 miles south of Dunlap in Harrison County. This 320-acre farm has 160 acres of Class I land, and 160 acres of steep, hilly loess soils with slopes ranging from 10 to 25 percent. The plan for this farm was developed with the assistance of SCS technicians. It calls for crop rotations, contouring, terracing, grassed waterways, and a gully control structure.

Hanigan built more than a mile of level terraces in 1956. Also, the three farmers living above him terraced the parts of their farms that drained into the Hanigan gully. By having the upland area terraced Hanigan was able to change the large gully into a grassed waterway. He bladed 85,620 cubic yards of earth into the gullies in converting 17½ acres of gullied area into a brome-grass waterway. Large, temporary diversions were built to keep the water out until the seeding gets well established, at which time the diversions will be bladed out.

The gully control structure, a hooded inlet type, with 92 feet of 48-inch asphalt coated corrugated metal pipe acts as the waterway outlet. Two hundred twenty-eight acres drain through this waterway into Mill Creek.

These three farms illustrate what can be done with what seemed at one time an insurmountable problem. In each case the procedure was the same. The first step was to build level terraces on the upland to hold as much water where it falls as possible. The soil is so permeable that level terraces do a magnificent job and the soil needs all the extra moisture that these water savers can hold. They save soil too, naturally.

The next step was to establish a stable grade. This may be done with some type of permanent structure, or the waterway may be carried to a point where the grade is stabilized.

The waterway is then bladed to a grade and width that will carry the expected water without cutting out the grass cover. Usually a speed of from 3 to 6 feet per second is considered safe by the SCS technicians, depending on the amount of area that must drain into the waterway. It is sometimes necessary to build temporary diversion terraces at the head of the waterway to keep the water out until the grass becomes well started.

Waterways that are started in late spring or late fall may need a stabilizing crop such as rye or sudangrass. It can be used as a mulch when the final seeding is made.

A good seedbed is absolutely essential to success in starting these waterways. The soil must be firmed with a disk, spike-tooth harrow, and cultipacker. Fertilizer must be worked into the soil during the smoothing and firming process.

High quality, live seed is a necessity, and seeding rates should be 2 or 3 times that normally used for meadows. Don't use too many kinds of grass—in fact, one grass with a short-



Gully on the John Hanigan farm near Dunlap, Iowa; (above) before treatment, (below) after treatment and seeding to grass.



lived companion crop is usually enough. The seed must be sown shallow— $\frac{1}{4}$ to $\frac{1}{2}$ inch deep if drilled, and on top of the ground if seeded by hand. Nitrogen fertilizer or manure should be applied to the waterway often enough to maintain a healthy, dense sod.

Most of the waterways in the loess area are dry waterways—that is, seepage water does not run down through them. On these waterways, brome grass usually forms the best sod. Reed canarygrass may also be used for “dry waterways.”

If the waterway is wet, reed canarygrass is the best grass to use. It may be established by seeding or by using the “green hay” method. In using the hay method, the hay is mowed and hauled directly to the area and spread. Where the soil is soft, the hay may be tamped in or be pushed into the mud with a board. New plants start forming at the nodes within a few days, and within a month’s time the plants should be 6 inches tall, with roots extending 8 inches into the soil.

On very wet waterways, tiling may be necessary in order to establish and maintain a stand of grass. Tile drainage is also essential on wet waterways to prevent damage during farming operations on adjacent land. Tile lines should be laid to the sides of the waterway, and at least $2\frac{1}{2}$ feet below the surface.

All waterways, and particularly those as costly and important as these “canyon healers,” will need good care to keep them safe.

NEGEV DESERT STUDY.—A study of the agricultural methods used more than two thousand years ago in the Negev desert of Israel will be conducted during the coming year by Dr. Philip Mayerson of New York University.

Dr. Mayerson teaches in the classics department of Washington Square College of Arts and Science. He left in August 1956 to study ancient ruins and agricultural irrigation systems in the Negev, check his findings from aerial photographs, and begin to establish criteria (never before established) for dating reservoirs, cisterns, and dams.

For several years Dr. Mayerson has been investigating the specific techniques that enabled the ancient inhabitants of the arid region to produce successful crops despite the low annual rainfall.

CEDARS COME BACK

Kansas farmer rejuvenates a cedar windbreak by severe pruning after snowstorm had almost demolished the trees.

By JULIUS H. MAI

IN the spring of 1949 when I got through with these cedars, they looked like a cabbage patch after harvest; now they look like tulips.” That is the way Clifford Lewallen, supervisor of the Thomas County Soil Conservation District, described the two rows of cedars as we walked through his farmstead windbreak last spring.

Before the big blizzard hit in November 1948, the 5-year old cedars were shoulder high. After the snowstorm they were buried under a snowbank 6 feet deep. The snow stayed on most of the winter. When it melted in the spring every cedar tree was broken to the ground. On close inspection Clifford saw that the top branches were stripped off. The main stems were bent and broken about a foot above the ground. He also saw that a good many of the lower branches on the stump were not damaged because they were just pressed flat on the ground under the weight of the snow.

Note.—The author is area conservationist, Soil Conservation Service, Colby, Kans.



Clifford Lewallen standing near a row of rejuvenated cedar windbreak.

Clifford Lewallen had no previous experience with a situation like this, but he knew that the broken wood would not grow again. So he decided to clean out everything that was damaged. When he was finished with the saw, the main trunk of every tree was cut off from 8 to 12 inches above the ground.



Side branches growing from cedar stump become upright leaders.

"Those two rows looked terrible, but I didn't know what else to do," said Clifford. "I thought sure they would never grow again. Before long though, I noticed that the remaining branches on the stump started turning up."

As time went on most of these same branches formed the new leaders. By actual count, each tree has from 3 to 6 leaders and they truly looked like the petals of tulips as Clifford so aptly expressed it.

Today those cedars are from 8 to 10 feet tall and there is complete closure in the rows. "As a matter of fact, I think they are denser and make a better windbreak than if they had not been broken down," Clifford remarked. Of course he does not recommend that undamaged trees be cut back, but he shows a good example of how well cedars will recover from snow breakage.

It is clearly evident that the success of this windbreak is due to the care Lewallen has given it. The space between the rows is cultivated throughout the summer to keep the planting free from weeds. Also, each spring he drags out the tumbleweeds blown in during the winter.

Lewallen's windbreak was planted in 1944 before he owned the farm. It is a 6-row, east-west planting, 650 feet long, on the north side of the farmstead. Beginning from the north there are 2 rows of Russian olive, 1 row each of honey locust and Chinese elm, and then the 2 rows of cedar on the south side next to the farmstead. The rows are spaced 20 feet apart. Within the rows the Russian olive are spaced 6 feet, the honey locust and Chinese elm 8 feet. The cedars are 6 to 8 feet apart.

When asked what he thinks of cedars now, Clifford said that more should be planted in every windbreak in this area. He believes they could well be planted on the north side for shrub rows. He concluded by saying: "I think they will be here and growing after all the broad-leaved trees are gone. They add color and make a more solid windbreak."

After 12 years there is evidence that the Russian olives in Lewallen's windbreak are getting a bit "leggy" and will in time lose the ground closure, shrub row effect. Some deadwood is appearing in the Chinese elm, which can be expected since they are rather short-lived trees. The deciduous, or broad-leaved trees and shrubs, initially make fast growth for early protection, but the evergreens are more permanent. Every windbreak should have several rows of evergreens and they should be so placed that they will make a good windbreak after the broad-leaved trees are gone.

CASH AWARD.—For his suggestion on how to save 3 man-days on each 80 acres of land leveled for irrigation, Herbert Belter, area agricultural engineer, SCS, stationed at Altus, Okla., has been given a cash award of \$190 and a certificate of merit. Belter supervises the SCS engineering work in 5 work units of southwest Oklahoma.

Profits Through Water Spreading

A former Texan rejuvenates a South Dakota ranch by building an elaborate system of water spreading structures.

By J. ARTHUR MARTIN

FLOOD irrigation, or water spreading, is a primitive system of irrigation using storm runoff, and is almost as old as agriculture itself. It was encouraged years ago in this country through the desert claim provision of the homestead laws.

Anyone who has seen the spectacular results of a good spread of floodwater on a flat of western wheatgrass or alfalfa needs nothing more to make him a firm believer in the practice.

In 1947 a displaced Texan, Floyd A. Mooney, loaded up his family and moved to South Dakota where he had bought a ranch lying astraddle the Belle Fourche River 40 miles east of Sturgis. Most of the 16,000 acres are thin soiled river breaks—steep, knife edged ridges, and narrow, deep draws draining into the river. Over the ages the river has lashed back and forth between the bluffs and shale banks on either side, and in places built up flood plains that now lie 8 to 15 feet above the riverbed. Some of the larger draws have made deltas where they discharge their loads of silt at their junction with the river. Others follow a cut bank channel to river level.

On Mooney's place are perhaps a thousand acres of river bottom land, that is nearly level but dry. Before cattle came into the country the river bottoms must have been meadows of stirrup-high wheatgrass. With the river as the only source of water, cattle stayed on the bottoms all summer long grazing them until, eventually, the grass was killed and replaced by annual saltbush. Here and there along the river a choice bit of bottom had been fenced for hay, protecting it from the concentration of cattle.

A family named Burton built the original ranch. They homesteaded on the river at the mouth of Haydraw, a 40,000-acre drainage that spread its floodwater naturally over a flat nearly a section in area. As the years passed, more of the watershed was plowed. The draw bottoms were grazed out and started to cut, and the silt load got bigger. At the mouth of the draw a delta built up, changing in size and shape with every flood. Burton built a ditch and floodgate in an attempt to get the water where he wanted it. But, silt filled the gate and ditch, and the draw started to cut out a new channel to the river, leaving half the flat high and dry. A few years' mowing of that area discouraged the wheatgrass, and it gave way to blue grama which was short enough to escape the mower.

When Mooney took the place over he decided halfway measures would not do. "We'll let the water flow out of the draw but on the bottom we will build a series of terraces or dikes on the level," he reasoned. "When the top one fills, water will have to spill around the ends and fill



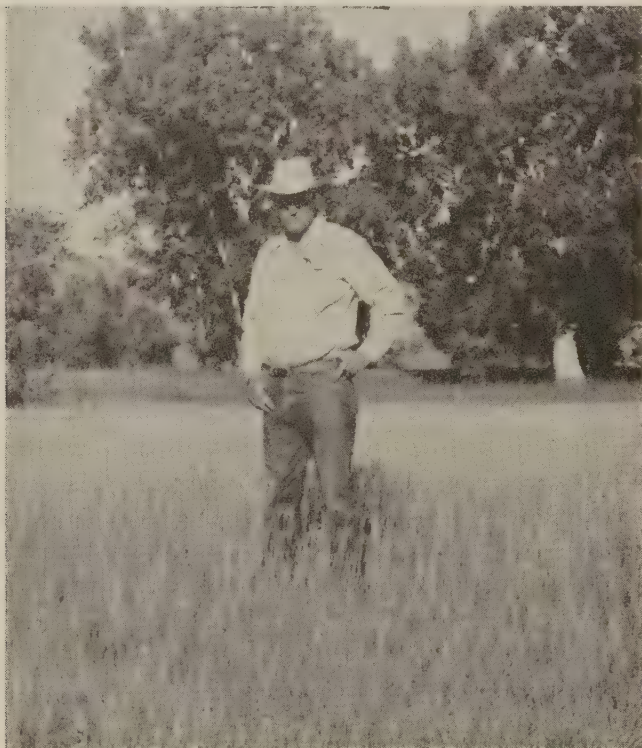
Newly constructed diversion on the Mooney ranch, haystack in the background.

Note.—The author is work unit conservationist, Soil Conservation Service, Sturgis, S. Dak.

the next one below. We'll cover the whole flat with water and let it soak in; or, if it stands too long, we can open the dikes and drain the excess into the river."

Soil Conservation Service technicians from the Elk Creek Soil Conservation District helped him plan and lay out the dikes. After hiring a contractor to build the first ones, Mooney decided to invest in his own equipment. He bought a medium-sized crawler tractor with a bulldozer for dirt work and a tool bar for farming. After four seasons the wisdom of this move is evident. In addition to building 17 miles of dikes 3 to 4 feet high, the tractor has been used to build 15 stock water dams averaging 5,000 yards of dirt; grade 2 miles of road from ranch headquarters to the county road; construct a mile of heavy canal to divert flood flows to the desired locations; do many hours of plowing, chiseling, and subsoiling on cropland; move hay a stack at a time; and remove snow after winter storms.

Haydraw drains so much land that it has run some water every year since the Mooneys took over the ranch. Following a year of average snowfall, the draw runs for nearly a month.



Floyd A. Mooney in a field of western wheatgrass that was irrigated by his water spreading system.

This flow is relatively small, being ordinarily less than 25 second-feet. Mooney steers this water around "by hand," opening a dike here, closing one there, holding it on the ground for as much as 3 weeks because the 8-foot depth of heavy clay and shale beneath the surface absorbs water slowly, and the western wheatgrass and alfalfa are not killed by being under water for so long a time in the cool weather of early spring.

During late spring and summer the system must be handled differently. The expected flows then will come from heavy rains or violent thunderstorms and Haydraw will change within minutes from a dry watercourse to a surging, turbid flood stream. In June of 1956 such a runoff occurred just after the first cutting of hay had been put up. According to Mooney, so much water poured over the flat that the dikes were completely submerged, the only evidence of them being swells on the surface of the floodwater. The peak flow lasted less than a day, and had practically ceased after 4 days. Mooney expected the wild, unbridled fury of the flood to leave scarcely a trace of the dikes, and was overjoyed when he saw that the damage was so minor that it could be repaired in a matter of hours. Perhaps half of the dikes had a single hole cut through them—a gap of from 3 to 15 feet. The others had to be cut with the bulldozer to drain them, for the flooding occurred during the hot weather when alfalfa can be killed by standing under water for 24 hours.

On Haydraw bottom, Mooney has moved 25,000 yards of earth to build 7 miles of dikes. The cost, at 12 cents per yard, would be \$3,000 or about \$6.70 per acre for the 450 acres covered. Maintenance and operating costs to date have been less than 20 cents per acre per year. He is convinced that the system annually rewards him with 400 tons more hay than he could harvest without it. In addition, he gets an alfalfa seed crop that could not be grown without the extra water.

After building the dikes, Mooney drilled Cossack alfalfa into the existing grass with no seedbed preparation, planting 4 pounds per acre in the early spring. Within 2 years, the alfalfa made such a heavy stand that grass was not evident in it at a casual glance. First cutting alfalfa has yielded as much as 2 tons per



Aerial view of F. A. Mooney water spreading system.

acre. The second cutting is delayed until the prospects for a seed crop can be assayed. In 1954 and 1955, Mooney marketed 90,000 pounds of No. 1 certified seed.

In discussing the spreader system, Mooney said that since the dikes were completed in 1952, floodwater from Haydraw has reached the river only once. All the other flows have been absorbed by the meadow. It is estimated that over 450 acre-feet can be stored in the soil of this particular bottom. A storage dam of equal capacity would be an expensive structure, and short-lived because of silt.

The silt, which is rich in plant nutrients, may be deposited against some of the dikes as much as 6 inches in depth from a single runoff. The alfalfa is killed, but western wheatgrass will thrust itself through the silt and flourish. Mooney has reestablished alfalfa on such areas by broadcasting seed on them as soon as the

water is off, at any time during the growing season.

Mooney has started developing spreader systems on 4 more bottoms, and has plans to do the same on 2 others. He says, "Some folks may think I'm crazy, but wherever it's possible to get the water and the soil together, I aim to make the effort. There are so many opportunities here that in my lifetime there is no chance to develop them all. I do want to leave the place a little better than I found it, and I hope the boys will continue on with the same idea."

HAWAIIAN SCOUTS PLANT TREES.—Boy Scout Troop 83 is sponsored by the Lihue Hongwanji Mission in Lihue on the island of Kauai, T. H. Up until the time that the East Kauai Soil Conservation District was organized, no merit badge was earned for soil and water conservation by any scout troop on Kauai.

In June of 1953, when the East Kauai Soil Conservation District was organized, Scoutmaster Tonaichi Fujii saw the opportunity for his Scouts to learn about soil

and water conservation. Soon after, Tamotsu Sahara, work unit conservationist for the East Kauai district arrived. Plans were made to teach the 27 boys about the various conservation practices on the East Kauai farms. In addition, tree planting was suggested as a living monument for the boys' part in doing a good deed, as well as to heal the eroded hillside on Kalepa Ridge.

Arrangements were made with Associate Forester Albert W. Duvel, of the Board of Agriculture and Forestry on Kauai, to furnish the necessary ironwood seedlings to plant in the erosion scars. The area selected was Kalepa Ridge, an eroded hillside a few miles from Lihue. Scouts with picks and shovels gathered at the scout room. Four hundred seedlings were planted that day. Tree planting on Kalepa will be carried on by each new group earning their merit badge in soil and water conservation.

Another item in the merit badge training was to teach the Scouts about the soils and the land classifications used in planning a farm.

On the Melvyn Mato farm, the Scouts studied the various land classifications and how the lands are classified according to their capability. Terraces were staked out, and Melvyn Mato demonstrated the construction of a terrace.

As news of the tree planting by the Scouts of Troop 83 reached other scout troops, they all became interested. Other boy and girl groups also organized tree planting projects.



Boy Scouts planting trees on eroded land in the East Kauai Soil Conservation District.

Cooperative Grass Seeding

A cooperative grass seeding project on fire-blackened land in Santa Barbara County, Calif., helps prevent floods and erosion.

By R. H. MORS

CONDITIONS on July 10, 1953, added up to what foresters call "fire weather." Grass and brush fields were tinder-dry, the thermometer stood at over a hundred, and a hot wind was blowing from the north. Forest Ranger Ed Smithburg at Santa Maria and other personnel of Los Padres National Forest were worried. Before noon their worries were justified—first a puff of smoke, then a roaring fire rushing through oak-grass woodland and dense brush fields. Five days later, when the fire was out, 60,000 acres lay blackened, half of it privately owned and half national forest—all of it in the watershed above the rich Santa Maria Valley; and all of it in the Santa Maria Valley Soil Conservation District.

On July 30, a meeting was held at the ranch home of John Fesler, in the burned area, to discuss measures for protection against erosion, flooding, and deposition that were sure to follow. This meeting was called by Soil Conservation District President Ernest Righetti and was attended by local ranchers and officials of all Government agencies concerned, as well as a reporter from each of the local papers. All present participated in the discussion of protection and rehabilitation measures.

Subsequent meetings were held in the soil conservation district office and at the Forest Service Pine Canyon guard station. These meetings were attended by representatives of all county, State, and Federal agencies that the district directors felt might contribute toward the planning and execution of a flood control and erosion prevention program.

Note.—The author is work unit conservationist, Soil Conservation Service, Santa Maria, Calif.



Norman Farrell of the Forest Service checks grass planting for brush seedlings.

A field survey and report by Soil Conservation Service engineers showed that debris dams would not be economically feasible.

The U. S. Air Force made a special flight and furnished the soil conservation district with a complete set of overlapping aerial photos covering the burned area. The farm advisor, district ranger of the Forest Service, and work unit conservationist of SCS spent 2 days in the field discussing a proposed seeding program with each of the 20 ranchers in the burned area.

It was decided to limit the national forest seeding to slopes of 50 percent or less, that were in dense brush before the fire, and that were burned clean. These were delineated on the aerial photos. They added up to 6,000 acres. George Roskie, resource officer for Los Padres National Forest, wrote a report to the Secretary of Agriculture requesting \$15,900 emergency funds for a seeding program on this area. The full amount was granted immediately.

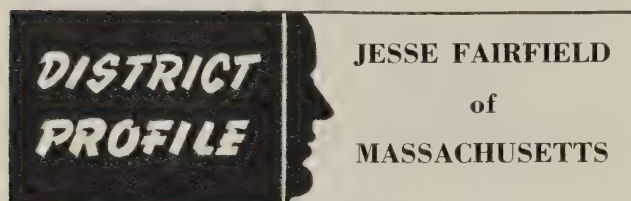
Forest Supervisor L. A. "Gus" Rickel negotiated a contract with a helicopter operator for seeding the more difficult sites. Ranchers were invited to have private lands seeded by the helicopter at contract price. Approximately 2,000

acres of private land were seeded by plane, helicopter, horseback, and afoot. All of the seeding was completed in October, before there was a rain on the ash. Seed mix for the national forest seeding was 5 pounds of annual ryegrass and 2 pounds wild oats per acre. A variety of seed mixes were used on the private land. Some included legumes and perennial grasses, as well as the basic ryegrass.

The seeding was found to be highly satisfactory the following spring. Grazing on both national forest and private lands has been conservative, and there was a good volunteer stand of grass in 1955 and 1956. By the summer of 1955, however, brush seedlings and sprouts were beginning to take over the areas that were in brush before the fire. It was apparent that further action was needed. That fall, the ranchers of the area, with guidance from Farm Advisor Geiberger, formed the Sisquoc Range Improvement Association. This is an association of ranchers organized to develop and execute a brush and range management program for their lands. Meetings are held the second Monday evening of each month in the Sisquoc Grange Hall. Attendance at these meetings

usually includes 15 to 20 ranchers, the farm advisor, district ranger, a representative of the California Division of Forestry, the county fire warden, the county office manager for ASC, the SCS work unit conservationist, and interested visitors.

The Range Improvement Association's program for 1956 included a series of brush control burns, followed by seeding and range management. Plans include spraying with brush killer later if necessary.



TO understand what Jesse H. Fairfield has done for soil conservation in Massachusetts, you have to know Berkshire County. Farmers are still reckoning with the glaciers—they must farm in between boulders, make their way through 400,000 acres of trees, and thread their agriculture along the floors of countless steep valleys.

Also, this is Tanglewood Music Festival country, and the landowner you're dealing with may be the first violinist of the Boston Symphony Orchestra, or a millionaire patron of the arts. On the other hand, you may run into recent arrivals from overseas, eagerly tilling New World soil.

That's the arena in which Jesse Fairfield, now 78, has led a remarkable resource effort for the past decade. In spite of odds, Berkshire's pioneering, under Fairfield's leadership, has had nationwide results.

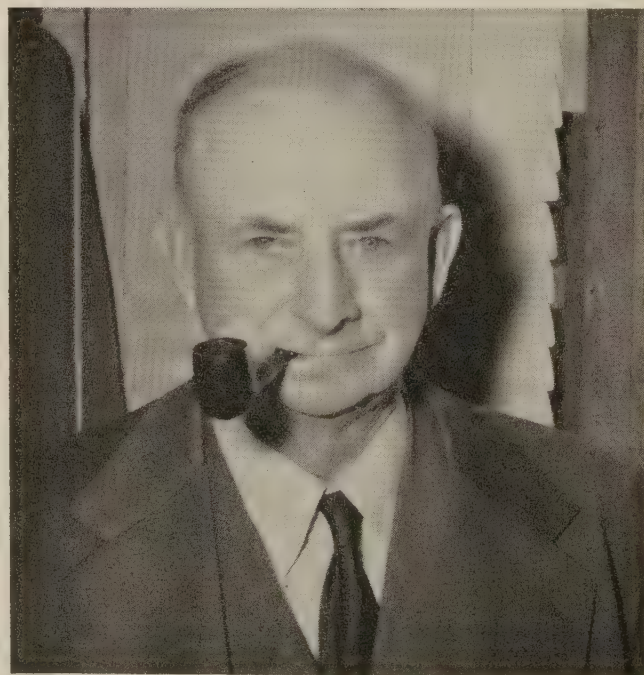
Wherever farmers pay cheaper fire insurance rates because of their handy farm ponds, they can thank early action of the Berkshire Soil Conservation District. It was Fairfield who gathered evidence of the value of ponds for fire protection from every district in a six-State area. He presented the package to the New England Fire Insurance Underwriters Association. "If you cut rates for items like good house-keeping," said Jesse, "how can you overlook a 300,000-gallon water supply right near the dooryard?"

The insurers couldn't, really. For the past 6 years, more companies have given credit for all water sources that help rural fire-fighting. This way, some Berkshire dairymen have saved as much as \$300 in insurance premiums per year. As the news has spread, Fairfield has carried on an ever-livelier correspondence with interested farmers all over the Nation.

The spry chairman has kept a sharp eye on the welfare of district cooperators—on occasion, doing battle with the giants. "I like to tackle the big boys," Jesse tells you with a wink. And what he calls "the district's first big project" is a fair example. That was when the dam of a large paper mill used to regularly back water up the brooks along the Housatonic River.

"Every spring, our farmers would have dipper ducks swimming where they needed to take hay," is the way Jesse puts it. He and the other supervisors shocked the paper mill into action with a bold request that floodgates be opened whenever hayfields were threatened. On top of that, Jesse and the board would go down and stand on a bridge near the mill, in plain sight, to see it done. Nowadays, farmers watch flood gages along the brooks. Emergency readings are called direct to the district office in Pittsfield.

Jesse saw to it that the district gave television one of its first farming "spectaculars." He



Jesse H. Fairfield.

helped direct the mammoth face-lifting of the Walter Hadala dairy farm at Adams. There, 30,000 visitors saw a vast fleet of machines do 5 years' soil conservation work in 1 day. Mobile camera units transmitted the pageant to the top of Mount Greylock, for relay to WBRK in Schenectady, N. Y.

Passion for details has typified Fairfield's leadership; has given Berkshire a beehive of resource attention. The district's tree farms are the pride of Massachusetts. The district-managed nursery has backed woodland work with production of more than 300,000 tree and shrub seedlings.

Located at the headwaters of 13 large watersheds, Berkshire is working hand-in-glove with adjacent districts in Vermont, New York, and Connecticut in this phase of land protection.

Berkshire farmers have won warm friends among Bay State sportsmen for their support of public shooting grounds and game improvement. Farm neighborhoods have installed hedge-rows and borders to invite wildlife. And, each summer, Bill Hill, Soil Conservation Service work unit conservationist of Berkshire, gives a hand to young sportsmen in the Massachusetts Junior Conservation Camp at nearby Beartown.

Unending variety in the district program is a good reflection of Jesse Fairfield's life work and interests. He operated a 300-acre dairy farm at Richmond until recently, and still farms a 30-acre patch, raising his own grain for a few head of beef, sheep, and a flock of hens. "I don't feel right unless I climb on a tractor once in awhile," is Jesse's explanation.

For half a century, he has been treasurer of the Richmond Telephone Company. Meanwhile, he led milk producers in a price campaign for dairy products; won a U. S. Department of Agriculture award for aiding the Berkshire County Agricultural Stabilization Conservation Committee; put in more years than he can remember as a selectman for his hometown.

When soil conservation was taking root in Berkshire, Jesse passed the hat among his neighbors. With \$145, he built a small, bypass pond to protect six homes, the town hall, and Congregational Church. Since completion, the pond water has helped put out three fires.

—BERNHARD A. ROTH



THEORY AND DYNAMICS OF GRASSLAND AGRICULTURE. By Jack R. Harland. 281 pp. Illustrated. 1956. New York: D. Van Nostrand Co., Inc. \$6.75.

IN this excellent book the author lays out an integrated set of basic theories of grassland agriculture derived, in part, from geology, plant and animal physiology, soil science, plant taxonomy, and ecology and, in part, from direct research and experience. He illustrates how these theories are used, along with pragmatic testing, to develop the best local system for a ranch or farm. He makes no attempt to cover all local systems, nor could he in a book of this size. As it is, he covers an amazing amount of ground.

The author draws from research and experience throughout the world in developing the basic principles. Although he tells us something of practices abroad, especially in New Zealand, the management suggestions are developed in most detail for ranges in the Great Plains and somewhat less for other ranges and for pastures.

This reviewer would give somewhat different emphases to a few of the many facts, principles, and ideas brought forward. For example, in explaining why some excellent pastures in western Europe are almost never plowed, I should have emphasized the harm that plowing does to the natural water channels produced by the soil fauna in ill-drained clay soils. Further, I should have liked more explicit suggestions for range evaluation and classification where the climax plant association cannot be discovered or where, when known, it is not a reasonable goal for range management. Each reader will probably find that he would also change the emphasis a little here and there. But considering the task he has undertaken, the author has done a masterful job.

For the scientist or technician concerned with grassland in any way, reading this book will be a rewarding experience. It will give him a brief review of his previous studies of plant, soil, and animal science and bring him up to

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date on recent progress. Equally important, he will see more clearly how the many facets of scientific knowledge relate together and where some of the most serious gaps in that knowledge lie.

Every agronomist, range conservationist, and soil scientist should benefit a great deal from this book. And so can those farmers and stockmen who have had opportunities for at least some advanced training in the basic sciences. Yet, without such training and familiarity with the terms and symbols of chemistry and biology, some of the book will seem obscure.

—CHARLES E. KELLOGG

PILOT CONSERVATION SCHOOL.—The Brockway-Snyder-Washington Joint School in Pennsylvania has started a "Pilot Conservation School." Through this pilot school all sixth grade pupils get acquainted with the conservation of natural resources. During the last 2 years 250 took the course.

The pilot school was developed in 1954. The State Game Commission, Fish Commission, and Department of Forests and Waters, and the Soil Conservation Service helped work out the course of study. They also furnished teachers along with the Extension Service.

The classes were taught through lectures, demonstrations, movies, slides, and a farm tour. The sponsors concentrated instruction within 3 days, with the regular teachers taking part throughout. They spread the actual conservation instruction, however, over a longer period. The regular teachers prepared their pupils for the concentrated course in advance. They followed through for a long period afterward.

Both years the instructors took the pupils by bus to the Ross-Leffler School of Conservation, owned by the Pennsylvania Game Commission. They divided the classes into groups of about 30 each. They broke these groups into smaller units for class and field trip purposes. Each pupil had a day of instruction on soils and soil conservation, half a day on forestry, half a day on fish culture and laws, and a day on biology. The biology instruction covered game identification and game laws. Conservation, of course, was always the central theme.

The physical culture instructor held regular recreation periods for the pupils. The art instructor took part

to obtain materials to use in her classes. Home Economics contributed the lunch. The English instructor added to the value of the course with themes and talks on conservation.

The soil conservation part of the course covered soils, slope, erosion, and erosion control. The instructors used slides to illustrate their lectures, emphasis being placed on local conditions. They also showed a conservation movie.

Each year the pupils made a tour of Charles Mortimer's nearby farm. They saw conservation practices they had studied in the classroom. They observed improved pastures, several kinds of forage grasses, waterways, terraces, wildlife borders, farm ponds, tree plantings, and selective woodland cutting.

To finance the program, the Jefferson County Soil Conservation District, the Brockway Sportsmen's Club, the Brockway school system, the Jefferson County commissioners, and about 30 individuals contributed either cash or materials.

—WATSON A. LUPHER

SIXTY POUNDS PER CALF.—"My calves averaged 60 pounds heavier last fall due to conservation practices on my land," reports Stanley Good, prominent rancher from Kenna, N. Mex.

Good had both hard and sandy range sites in the same pasture. The only watering place was on the hard land. Even though the sandy land grass came out earlier in the spring, the cattle would not go back on it because of the distance from water. Proper use of the sandy range was not obtained and the hard land was overgrazed.

With his problem in mind, Good sought assistance from the Border Soil Conservation District. Soil Conservation Service range specialists helped him reorganize his pastures and develop a grazing plan.

New fences following the site boundaries were built, and old ones were removed. Water was piped from the hard land to the sandy land, and drinking tubs were spaced at regular intervals along the line.

"Through these two conservation practices I was able to get uniform use over the entire pasture," says Good. "In the future I plan to do some more fencing and extend the pipeline into a lower pasture. The additional weight on my calves more than pays the cost of the practices as well as protecting my range."

—JAMES MORGAN



FEBRUARY 1957

Soil Conservation

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION.

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SECRETARY OF AGRICULTURE

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U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

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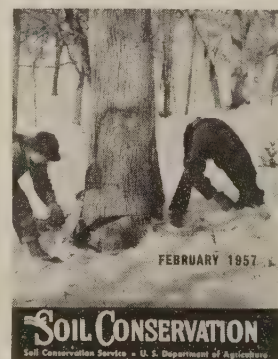
4-H CONSERVATION CLUB.—Pioneering New Jersey's number one and, thus far, only 4-H Club for soil, water, and wildlife conservation, boys of Mercer County have taken on an ambitious project they figure will take over 5 years to complete. Their first year of accomplishment has stirred youth interest up and down the State.

They're emphasizing action. On their initial get-together, they went to a conservation-planned farm near Princeton. They studied the plan and thereupon planted five different species of shrubs to feed and cover upland game.

Since then, the boys have made and identified a wide collection of New Jersey rock and soil samples under the direction of the State Soil Conservation Service soil scientist. They've explored soil erosion, land use, and conservation practices on half a dozen local farms.

Expanding their program to include enjoyment and wise use of natural resources, the club recently added hunting, rifle marksmanship, and firearms safety to their list of events. Their charter meeting drew 8 members; at the latest meeting, 20 boys and 4 parents joined the fun.

—HARRY R. SLAYBACK



FRONT COVER.—A white oak wolf tree is being cut on a Minnesota farm to allow more room for seedlings and younger growing trees.

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Are Black Days Ahead For Kansas?

The state conservationist discusses the probability of severe wind erosion in the western part of Kansas during the winter and spring of 1957.

By FRED J. SYKES

ALMOST every day I am asked how much wind erosion we are going to have in Kansas this winter and next spring.

There are some "ifs" involved; but no matter how you look at it, the picture is not bright.

The situation can be summed up this way: We can expect severe blowing—if, as normally expected, hard winds come.

It is apt to be worse than it ever was in the thirties. Larger acreages are without cover and far more of the extremely hazardous lands are exposed.

But this ray of encouragement brightens the other side: The farmers of Kansas have done a remarkable job of fighting the threat with emergency tillage.

Before I go any farther I'd like to emphasize something that many people seem to forget.

Note.—The author is state conservationist, Soil Conservation Service, Salina, Kans.

The 5 years of drought, one of the factors contributing to the situation, are not abnormal. You have only to look over our rainfall history. Droughts such as this are natural to this country.

The chief trouble is we can't predict when the droughts will come. If we could, we would be more nearly ready for them.

We can normally expect sometime during each winter and spring the kind of winds that will damage exposed soil. These winds may be the high velocity kind that do their harm quickly. Or they may be more moderate in force, but cover a period of days. Either kind tears the exposed soil loose and makes life miserable. We were pretty lucky in the matter of winds last year.

Kansas is the largest winter wheat producing State in the Nation. From 1942 to 1952 it seeded an average of 14,202,000 acres of wheat, harvesting an average of 12,707,000 acres. The



Soil blowing started on this western Kansas, terraced wheatfield in the fall of 1956.



A typical western Kansas sorghum crop on dry land in 1956. No grain matured.

State's average annual harvest of wheat over the 10 years ending with 1952 was nearly 204 million bushels.

Kansas also grows large acreages of grain sorghum—for grain, forage, and silage. Over the 10 years before 1953 its grain sorghum acreage averaged 1,475,000, its yields averaging 28½ million bushels.

As the drought clamped down, the 1953 area in grain sorghums was about a half million acres above the average. In 1954 it rose to more than 3 million acres.

Both wheat and grain sorghums can provide good stubble in years when there is enough

moisture. Crop residues, when properly used, afford great protection to the soil. The residues shield the soil from wind and return to the soil organic matter so important to its structure and productivity.

The Kansas land in condition to blow—that is, without cover to protect it against high winds—was more than 10 million acres in December 1956. This was scattered over the western two-thirds of the State.

This land falls mainly into three categories: (1) Land that was summer fallowed—rested to store up moisture for the following crop; (2) land on which the crop for 1956 failed, or (3) land that produced a crop but that was harvested or grazed in a manner to leave the soil exposed.

All of this land is lacking in residues to protect it.

There are also acreages of rangeland on which the plant cover made little or no growth last year or that may have been overused.

Rainfall varies in this country from less than 50 percent of the longtime average to more than 150 percent. There are usually several years when the rainfall is below this average and then a succession of years when it is above.

The average rainfall of around 16 inches is just about enough to grow the crops that are adapted. Any less means a short crop or failure. More moisture means better than average yields.

In the development of agriculture in western Kansas, the farmers put the lands most suited



Farmer Kenneth W. Davis (left) and Fred J. Sykes examine a thin stand of grass on a field retired from cultivation and seeded to grass a few years ago.

for crops into cultivation. The more critical lands were not plowed until later.

There were two periods of rapid expansion of our cultivated land. One was between 1920 and 1930 just after World War I. The second was from 1945 to 1952 after World War II. In both periods there was above normal moisture.

The drop in the price of wheat in 1930 was the first sign of disaster in that period. In 1931 there was a bumper crop and the bottom fell out of the price structure. Wheat sold at 25 cents a bushel at the elevator. It was a crushing blow to wheat farmers. Then a long drought set in; farmers pulled out by the thousands.

Since the 1930's around 2 million new acres have been brought into cultivation. This includes much of the poorer soils in the 16-inch rainfall belt. Large acreages have been broken out in areas that in normal years should not be expected to grow harvestable wheat. In above normal rainfall years, however, it produces wheat at a profit.

Then, scattered throughout the State are more than 2½ million acres of land that, even under favorable moisture conditions, cannot produce enough to repay costs.



A few dying wheat plants give little protection to this Kansas field.



Blown soil and tumbleweeds have almost covered this tractor and plow during the last 2 years.

Kansas farmers generally have put forth great efforts in trying to protect their exposed soils with emergency tillage. This represents the cooperative effort of all the agencies working on the problem. This measure, however, cannot be expected to perform miracles. On some lands, tillage can do little or no good. These are lands without cover that have been worked so often that the soil is loose and finely pulverized.

Another factor on the minus side is that many of our present farmers are short in experience. Not many of the farmers who went through the thirties, and learned hard lessons, are farming now. In their place is a new generation, unaware of the hazards besetting their land.

On the credit side is the matter of good equipment. The lack of equipment was one of the distressing problems 20 years ago. We now have equipment of the kind needed to carry on emergency tillage as long as it is effective.

Also on the credit side is the help in technical know-how and funds given by the Federal Government. In this respect, the Soil Bank, represents a big opportunity. I think we should consider putting into the Soil Bank these millions of acres of poor lands that are not profitable to farm. We should put them into the conservation reserve with help from Federal funds to restore them to perennial grasses. And a part of our better lands should go into the acreage reserve for soil improvement and protection.

(Continued on page 166)

A Brief Tour of Russia

A soil conservation district supervisor discusses some of his observations while on a tour with other Oklahoma farmers and farm leaders in Russia.

By CHARLES HOLLOPETER

THE tour of Oklahoma farmers to Russia during May 1956, was an exceptional experience to most of us. This group of 29 men, engaged in various forms of agriculture, were out to explore the major centers of interest in the Soviet Union. But farming was, by no means, the sole attraction for these farmer tourists.

In Leningrad, as well as in Moscow, we found ourselves completely engrossed in the art and culture of Russia as we passed through numerous museums and art centers. In fact, Russian art and culture were literally running out of our ears before we visited any of the agricultural areas in which we were primarily interested.

While in Moscow, we visited our first tractor station, located some 20 miles northwest of the city. Here, 82 tractors are maintained. They range in size from 15 horsepower, steel wheel units to larger and newer 52 horsepower crawler type tractors. These tractors, as well as other heavy machinery, are used on nearby collective farms and State farms under an agreement whereby the tractor station receives a portion of the crops.

State farms are strategically located throughout the Soviet Union, much the same as our experiment stations; but the Soviet farms serve as demonstrational units to carry out the new and better methods as they are developed. The workers on the State farms are paid a monthly salary, with an additional bonus if production exceeds their norm.

We visited a State farm located some 50 miles west of Moscow where the major interests were poultry production and dairying. Their feeding methods and rations were quite interesting, but were geared for a much colder cli-

mate than ours. Dry lot feeding was practiced, as the cows were maintained in a barn during their entire lactation period. Their average annual milk production per cow is increasing, and now stands at about 1,690 gallons per cow. Women milk the cows by hand 4 times a day, working in two 8 hour shifts. Twenty-two cows are milked by each woman, as her production norm.

The collective farms, of which there are 89,000 in Russia, are the principal source for surplus agricultural production. Here both men and women are actively engaged in the production, harvesting, and processing of their products. These farmers share in the farm's productiveness on the basis of their man-hours of labor. After deducting the tractor costs, taxes, seed, feed, and costs of other services, the proceeds are divided among the workers according to their labor. The Ministry of Agriculture announces at the start of each crop season which crops are to be grown and the price to be paid. Severe weather, as experienced in Russia the past winter when the temperature reached as low as 60° below zero, destroyed much of the wheat crop.

One of our most interesting experiences was the visit to the Agricultural Academy in Moscow. In this college, which was established in 1865, they have been in continuous operation for 90 years studying all types of agriculture. Their study of soils and agronomy is outstanding. This college offers a 5-year course, and the students are evenly divided between young men and women. This ratio also extended to the faculty, the women teaching gardening, fruit growing, entomology, zoology, and many other subjects. Their studies, in most respects, were similar to those in our agricultural colleges, except that they also include fish culture and studies of marine life grown in large, man-made lakes located on the college farm. It was during the briefing of our group by the president of the academy, G. M. Losa, and his faculty

Note.—The author is chairman of the board of supervisors of the Western Kay County Soil Conservation District in Oklahoma. Formerly, he was a soil scientist with the Soil Conservation Service.

that I, through our interpreter, expressed our appreciation and thanks to the early Russian scientists who perfected and used soil classification methods that were copied by our own Department of Agriculture shortly after the turn of the century. To this Dr. Losa replied, "Yes, we know your able Dr. C. F. Marbut, for he spent a year here in this university and studied under our Professor Glinka many years ago." He added that Professor Glinka's grandson is now a member of their faculty, though he is teaching animal husbandry instead of soils. Here was a third generation still teaching in the same university.

At the academy we were taken on a tour of an elaborate display of some 2,000 mounted soil profiles, representing each of the major soils of the Soviet Union, ranging from the frozen tundra of the Arctic region to the laterite soils of the subtropics. With each of these soils were pictures of the typical landscape, as well as samples of the original vegetative cover. They also were proud of their soil profile exchange with other countries, showing us soils of Eastern Asia. They expressed an eagerness to exchange soil profiles with the United States.

As the subject turned to grasses, we found little understanding beyond their cultivated crops until one of our group, A. P. (Red) Atkins, of Guymon, Okla., brought in the Latin names of our native grasses; and from then on those of us who knew the Latin names were able to act as interpreters for the others.

The graduates of this agricultural academy are sent to some of the 800 junior colleges and other agricultural colleges and to the State farms within the Soviet Union as teachers. They told us that about 70 percent of the academy graduates became teachers or entered some technical field, while the other 30 percent worked in some practical field of agriculture.

Animal husbandry, especially the development of higher producing milk cows, is an important part of their projected plans. Horses, beyond doubt, have played an important role in the history of Russia, and are, by no means, to be overlooked as an important subject of popular discussion. It was interesting to all of us to learn that they devote one entire college classroom building to the study of horses and the physical makeup most desirable for draft animals, as well as for wartime adaptabilities.



Oklahoma farmers on tour in Kiev, Russia, with Russians, in foreground, acting as guides.

On a number of our farm visits we heard the report that Russian agronomists had developed a perennial wheat, which, if true, could revolutionize the production of that commodity. At the agricultural academy we learned that this was still in the plans, but so far was classed as wishful thinking.

On a typical Russian collective farm we found an exceptionally friendly greeting. Before we left we felt a closer kinship to these people by our common understanding of their problems and interests. We learned that 41 percent of the people in Russia are farmers. What they lose in technical skill and, I might add, efficiency, they make up in long hours of hard work. There is an air of independence about the thatched roof farm home, even though it is crowded, as compared to the giant apartment houses of the industrial centers. For each farmer owns the 1 hectare of land, approximately 2½ acres, on which his house is located. Here he can raise his own garden, or keep his own cow or pig.

Soil conservation on the vast acres of collective farms is relatively unheard of; yet evidence indicates that some severe erosion has taken place. The usually gentle rainfall and generally moderate to gentle slopes are not conducive to rapidly accelerating erosion. Also, there is the fact that much of their annual moisture comes in the form of snow, and this moisture soaks in gradually. Yet, to a former soil surveyor, the erosion seems severe enough to warrant more attention than is being given.

The establishment of a soil conservation

plan there would, no doubt, be quite different than our accustomed methods.

Perhaps the best example of Russian methods came to light during one of our many comparisons with our able interpreter. We were discussing the work of our county extension agents and explaining that this type of information to our farmers was free for the asking and that the farmers were free to accept or reject this help as they so desired. To this our interpreter asked, "Why, then, if your Government thinks it is good for the farmer, is he not required to accept and follow this information?"

Even though the Communist government, through its vast and effective education system, appears to be making an all-out effort to develop engineers and scientists in many fields, it is apparent that their technical agricultural fields have not kept pace. This will eventually lead to greater problems in the future.

The soils of Russia are, for the most part, developed under both prairie and mixed forest cover over a conglomerate water-laid material similar to our coastal plains soils. The vast, undulating topography of the Ukraine is broken by slow, and in many areas, poorly drained, swampy areas. Along the Dnieper River is a wide belt of light, sandy soils similar to the loess soils along our Mississippi River. It was interesting to learn that soil fertility had been maintained to a remarkably high degree in the Ukraine by the liberal application of barnyard manure and compost at an average of 5 tons per acre annually. On this, they reported a wheat yield last year of approximately 25 bushels per acre. The use of complete fertilizers are proving quite profitable on a 25-50-25 formula, particularly in the production of sugar beets.

The desire for world peace was so frequently expressed by the farmers we met that none of us could escape the feeling that their expressions for world peace were sincere.



Russian school children march past a display of the heroes they are taught about.

MAGAZINE SUBSCRIPTIONS TO SCHOOLS.—The board of supervisors of the Hamblen County (Tenn.) Soil Conservation District has given a 1-year subscription to SOIL CONSERVATION Magazine to each county school library and to each department of vocational agriculture in the county for the current year. The supervisors also gave each school a packet of soil and water conservation material for teachers.

The First Three Years

A young dairy farmer wins an award for conservation farming within 3 years from the time he decided soil and water conservation were essential for success.

By EDWARD R. KEIL

CLEMENS MITCHELL is a young New York farmer who believes that farming has a future. He's preparing for it.

Three years ago young Mitchell didn't think his farm had much of a future. The topsoil was getting mighty thin. For years erosion had been gnawing away at his long, unprotected slopes. Row crop and pasture yields were skidding down, down, down He watched with growing anxiety as his cows gave less and less milk.

Note.—The author is deputy state conservationist, Soil Conservation Service, Syracuse, N. Y.

Mitchell decided that there was only one way to stop this downward plunge—that was through a soil and water conservation program. He signed an agreement with his Rensselaer County Soil Conservation District. He agreed to plan and apply, with district and Soil Conservation Service help, all the dovetailing conservation measures his land needed. That way, he figured, he'd stop erosion and improve his land.

Recently Oliver A. Hyatt, the district's board chairman, gave Mitchell a bronze plaque. The young farmer had captured the district's award



A view of the Clemens Mitchell farm in the background with Mitchell (left) and SCS technician Henry Ruckaberle in the foreground.



Clemens Mitchell clearing brush and trees.

for applying more conservation measures within the year than any other cooperator.

Mitchell has a lot to do before he gets all his planned conservation measures on the land. But already his conservation work is jingling the cash register. For example, yearly milk production is up 1,000 pounds per cow.

"We're milking eight more cows than we ever milked before," Mitchell said. "And we're not buying any feed except concentrates. In the past, as forage and grain crops failed we'd have to sell a cow or two. I figure that in time my conservation work will increase production all along the line by at least a third."

Mitchell farms 566 hill acres. That includes 200 adjoining acres he rents for pasture and meadow. He controls grazing carefully on the steeper slopes to conserve the grass.

On 137 acres Mitchell raises corn and oats in rotation with hay. He fertilizes and limes his cropland. He has improved part of his 57 acres of permanent pasture by applying 2 tons of lime per acre and seeding birdsfoot trefoil. He plans to improve all his pastureland in the same way. Fertilizing according to test is in his plans.

Conservation farming has stretched his grazing season. It now runs from mid-May to mid-October.

Mitchell has fenced most of his 102 acres of

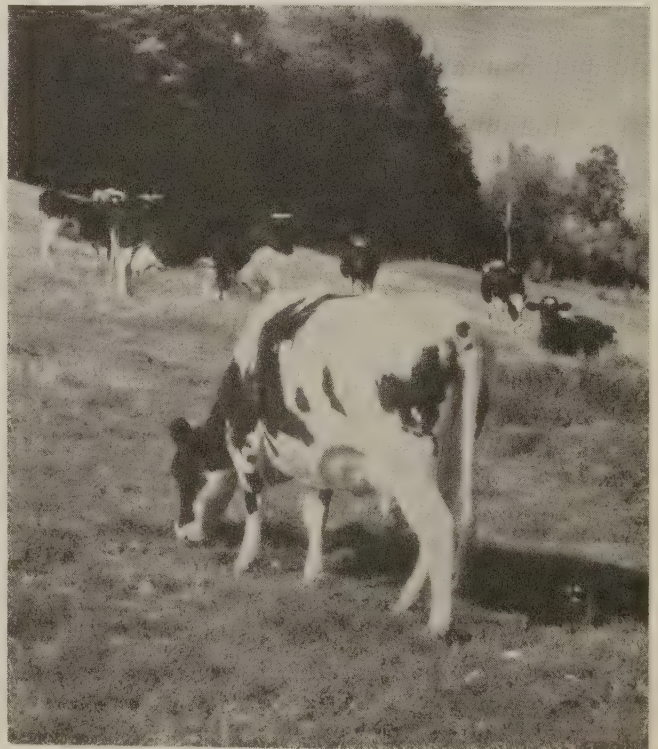
woodland and will soon complete the job. "I expect to cash in on my woods and don't want cattle grazing and trampling to cut down on my profits," he explained. He plans to rid his woodlands of culls and other worthless trees to give income-producing timber a better chance to develop. He'll replant thin spots.

"I now have 70 acres in native pasture where the slope is too steep for grazing," Mitchell said. "That's all going back into woods—pines.

Mitchell's rotation pattern is 1 year of corn, 1 of oats, and 4 years of hay. He uses alfalfa-timothy and alfalfa-bromegrass for hay.

Other major practices in Mitchell's overall conservation plan are diversion terraces and tile drains. The diversions block water coming down the slopes, carry it along slowly to a safe outlet. The tile drains off water that gets trapped below the soil surface.

Mitchell has 85 Holstein cattle. He usually milks about 40. His production is now up to about 350,000 pounds of 3.6 percent milk a year. He is improving herd quality through artificial insemination. Milk goes directly from his cows to a spotless all-metal tank. From there a plastic hose takes it to a tank truck. It's not touched by human hands.



Dairy cattle on the Clemens Mitchell farm.

Young Mitchell runs the whole farm with only occasional help from a hired hand. Modern machinery and labor-saving methods make this possible. He counts, though, on a helping hand from his mother and sister.

VO-AG BOYS STUDY RANGE CONSERVATION.—

Colorado's large acreage of rangeland, under both public and private ownership, is one of the most important segments of the State's agriculture. Unfortunately, this valuable resource in past years has not been fully understood and appreciated by those who use it. Now, however, the wise use and improvement of these rangelands is receiving increased attention from all individuals and groups that have an interest in any phase of range use and management.

An outstanding example of this interest is the educational program recently promoted by soil conservation district leaders in the Republican Watershed Association of Soil Conservation Districts in northeastern Colorado. These leaders decided that the best way to promote range management for the future was to give more and better training to vocational agriculture students in the high schools.

Local residents, school board members, and vocational agriculture instructors throughout the area were contacted to stimulate interest in range conservation training for FFA members. The sanction and cooperation of the State Department of Vocational Education was sought and obtained.

A general meeting to make plans for getting the program under way, called in February 1956, resulted in cooperation of individuals and agencies that work in the field of range management; the State Department of Vocational Education, and vocational agriculture instructors.

Interest was keen among vocational agriculture instructors from a wide area who got the program off to an excellent start by participating in a range training workshop on July 30 and 31. Staff members from Colorado A & M College, Soil Conservation Service, and Extension Service were joined by local ranchers in arranging the workshop agenda. The purpose was to acquaint the agriculture teachers with range plant and site identification, criteria for determining range condition, applicable improvement practices, the economic benefits of sound range management, and sources of additional teaching material and aids.

A concentrated 2 to 4 week range training period in the vocational agriculture classes throughout the northeastern area of the State, during the first fall quarter, was climaxed with a range judging field day for all participating schools and individuals at the Kenny Conrad Ranch in Yuma County on October 13.

Students identified and classified range plants, determined range condition on different range sites, and recommended treatment or management practices to maintain or improve the range condition.

Again at the field day, agency and individual cooperation toward furthering the benefits of this program was apparent as SCS, college, and Extension Service personnel joined the agriculture teachers and local ranchers to select range sites, stake and number range plants, conduct the student groups, and tabulate final scores.

The Colorado Association of Soil Conservation Districts furnished suitable trophies for the school with the most participants, the high scoring team, and the high scoring individual.

With the firm basis on which this program has been established, and the impetus it is receiving from everyone who comes in contact with it, future growth and expansion to other areas of the State is expected.

CARL W. HERZMAN—
Extension Soil Conservationist

USING SOIL SURVEYS.—As soon as the new soil survey map of Northumberland and Montour Counties, Pa., was published, County Agent Leonard G. Yearick and I got together to plan full-scale use of it. We figured it was of practical value to a lot of people besides professional conservation and agricultural workers.

We first planned a study session for an invited list of people we thought could get something out of the soil survey. The session was held in the Northumberland Senior High School library. Ten interested persons plus a few agricultural professionals attended. We had distributed the soil survey map beforehand so that those attending would be familiar with it.

At this study session was a farmer, a banker, a farm loan organization representative, a feed dealer, a real estate man, 2 vocational agriculture teachers, and 3 agricultural representatives of a public utility company. David C. Taylor, soil scientists of the Soil Conservation Service, presided and led the discussions.

The group showed great interest in the maps and the soil descriptions found in the booklet. The realtor said the soil survey would help him guide his clients to the kind of land that could be used for what they had in mind. The banker and farm loan organization representatives said the survey would be valuable in helping them to decide how much could be safely lent to borrowers. The teachers felt that it would help them in teaching the value of soil and the need for conserving it.

Yearick and I had at first hoped for a large attendance. But we learned that a small attendance of not more than 10 or 12 was better. With the small group, we were better able to answer questions from everyone and to give greater attention to the particular needs of each one present.

This meeting confirmed our belief that widespread practical use can be made of our soil surveys. We are planning to hold further study sessions.

—D. JOSEPH SACCO

Conservation on "Terraced Bay"

A soil conservationist discusses some soil conservation problems and methods on Formosa.

By I. K. LANDON

STRIP the soil and water conservation problems of Taiwan to essentials and they may seem much like those of the United States. But consider the people, their traditions, type of farming, and the present pressure on the land and you have an entirely different situation.

Taiwan, meaning "Terraced Bay," better known to the Western World as Formosa, "Isle Beautiful," has gully erosion and sheet erosion; it has land being used beyond its capabilities; it has lakes and reservoirs that are silting up. It has denuded forest areas that cause disastrous flash floods with resulting caving stream banks and aprons of rocks and silt covering productive land.

Taiwan has watershed problems and is beginning to recognize them as such. There are no local organizations such as soil conservation districts to handle these problems, and none in the making at the present time. But Taiwan has watershed demonstrations and it is beginning to get "spread of practices." The Provincial Department of Agriculture and Forestry has a section of soil and water conservation.

It's the age-old story of having plenty of land in the beginning. But an increasing population put additional strain on the land. Farmers responded with increased production. But they didn't know the best methods of getting high yields while protecting land resources. Like most other countries Taiwan has little new land to develop. Its only frontiers are those of the farmers' mind and the adoption of better methods.

Taiwan is a subtropical island of about 8,882,000 acres. Nearly two-thirds of the area is classed as forest land. Two million acres must feed and clothe the people and provide export crops to help build up the limited and

much needed foreign exchange. A million and a half mainland Chinese forced to Taiwan by the Communists in 1949 brought the population to about 10 million. Arable land per person averages 0.2 acres. And the population is increasing at more than 3 percent a year.

Other factors, in addition to population, that cause intensive farming of much of the land are: (1) Expansion of military installations, (2) destruction of previously cultivated fields by gulying and streambank caving, and (3) urban and industrial expansion.

Varied conservation measures have been urged in the past, many with considerable success. They include reforestation of sloping and denuded land in the hills and mountains; use of windbreaks on the western coastal plains to stop wind erosion and sand dune development; use of legume cover crops, especially in or-



Taiwan hillsides with newly constructed bench terraces

Note.—The author is soil conservationist for the International Cooperation Administration, stationed on Formosa. Formerly he was an employee of the Soil Conservation Service.

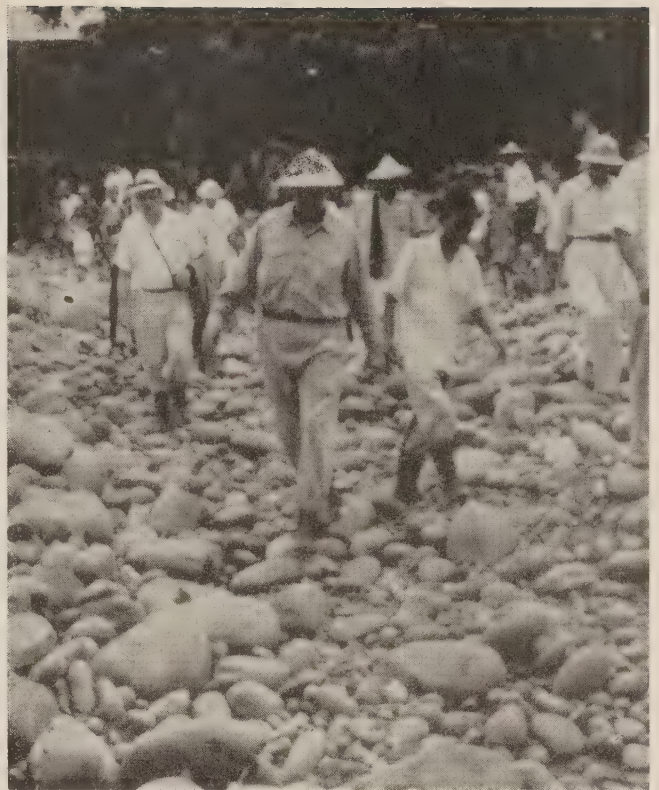
chards and between dryland crops; contouring; and other soil and water conserving measures. Bench terracing, even on fairly level land, has been used for decades to create irrigated rice paddies.

The Joint Commission on Rural Reconstruction, a Chinese-American agency that carries out the agricultural phase of the International Cooperation Administration program in Taiwan, added a soil conservationist to its staff in 1954. The author took that job. He is 1 of 12 Americans and more than 100 Chinese technicians and administrators of JCRR helping Chinese Government agencies on a wide variety of rural programs.

Since research data was lacking, runoff plots were established. Last fiscal year information was collected on 75 field plots at 5 different locations. The work is handled by the Provincial Department of Agriculture and Forestry and the College of Agriculture at National Taiwan University with technical and financial assistance from JCRR. The observations obtained will furnish a basis for modifying some conservation practices to better adapt them to local conditions.



are a result of recent soil conservation demonstrations.



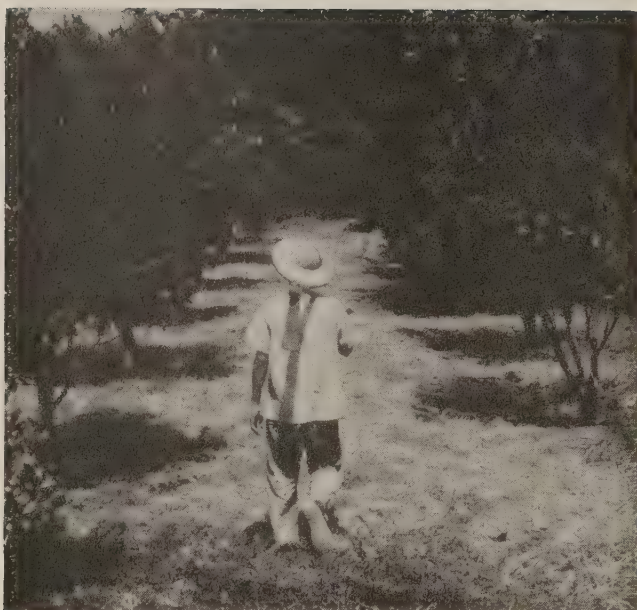
I. K. Landon leads a group down what was formerly the main street of a farm village in Taiwan.

To train local technicians and to demonstrate soil conservation practices to farmers, field demonstrations were started. Farms in Taiwan average only about 3 acres. Farmers have relatively small financial resources but labor is cheap and most of them have large families. It is remarkable what can be done with a water buffalo and a steel-pointed "V" drag or a locally-made scraper patterned after an American make if you have plenty of man-hours.

Farmers here have the same inherent love of the soil as any true lover of rural life. They also have the normal human desire to better their lot.

Compost houses are an important business on any Taiwan farm. Practically all refuse is returned to the soil. Every corner of land is used for something. Farmers who claim they make no money out of pork keep hogs for the manure. Use of fertilizer has been increasing by leaps and bounds for several years. All of these methods plus improved varieties and insect control resulted in record breaking rice crops in 1954 and 1955.

The land-to-the-tiller program, which gave every farmer the opportunity to become a land-



A cover crop and mulch protects this Taiwan orchard from erosion.

owner, and reorganization of farmers' associations into bona fide farmer operated organizations have given farmers a new outlook and a new lease on life.

What has happened in the Ahkungtien watershed in southwestern Taiwan is an outstanding example of what is happening in soil conservation. We can point to only 3 such cases now but a program is starting in 3 other watersheds and the idea is spreading. Many soil conservation measures have been used for a long time and their use in Taiwan is spreading as the educational program gains headway.

The Ahkungtien reservoir has a capacity of 36,500 acre-feet, and irrigates 5,370 acres of land in Kaohsiung Hsien County. Much of its

watershed of 7,025 acres is cultivated land on steep slopes.

After repossession of Taiwan by the Chinese in 1945, the land, formerly held by two Japanese companies, was given to the Taiwan Forestry Administration of the Provincial Government and to the Kaohsiung County Government.

Farmers have brought more and more of the land under cultivation. The combination of heavy rainfall, steep slopes, and careless cultivation resulted in serious erosion. Three years after the reservoir was completed more than 2½ million cubic yards of silt—in some places 25 feet deep—had been deposited in the reservoir.



Water disposal chute on a Taiwan sugar corporation farm.



Soil conservation trainees building a terrace with locally made fresnoe.

A multiple-agency committee was organized to control siltation. The program of this committee was to recall from cultivation and reforest all land with a slope of more than 10 percent. Several difficulties in enforcing this program soon became apparent:

1. The farmers on this public land, though illegal tenants or squatters, were dependent on it for their livelihood and could not be driven off under existing customs.

2. Sugarcane produced in this area made a significant contribution to the foreign exchange earned from the sale of brown sugar.



Runoff plots on the Taiwan Tea Corporation Experimental Farm near Linkou.

3. Old cropland, even after reforestation, would continue to contribute silt to fill the reservoir until an adequate forest cover was established. This would require several years.

As a means of overcoming these difficulties, the committee approved a plan permitting the farmers to construct level bench terraces and continue farming the best of the fields. Although the bench terracing program was started late in the spring of 1956, farmers applied for permission to bench 497 acres. They were not familiar with the specifications set up by the committee, and only a few of the benches were acceptable on the first inspection.

After faults were pointed out, the farmers corrected them so that by the time of the summer's typhoon rains, of the 128 acres that had been benched only $6\frac{1}{4}$ acres failed to meet the specifications.

These 497 acres are only a small part of the watershed but, to the extent that bench terraces have been constructed, the farmers can continue to earn their living, the sugar mill will have raw materials, and the siltation of the reservoir will be checked. With a better and earlier edu-

cational program this year, more farmers can file applications, have their lands inspected, and start construction earlier in the winter.

A program of permitting illegal tillers of public lands to continue cultivation, providing they will protect them from erosion by building benches, may be hard to visualize in the United States. But it is a practical and humane method of protecting the Ahkungtien Reservoir from siltation and demonstrating what can be done with such land. And other farmers in nearby watersheds are starting to build bench terraces or improve the ones they have.

In addition to on-the-job training of Chinese soil conservationists both in provincial and local governments, a special course was held in April and May 1956. It included both classroom sessions and field experience. Fifty field employees of the Provincial Department of Agriculture and Forestry and of county and township government agricultural offices attended. Their effectiveness after returning to their local stations is shown by the rapid increase in requests

(Continued on page 166)

Pastures Need Weed Control

No. 20

This is the twentieth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By DAYTON L. KLINGMAN

WEEDS can be controlled in pastures more efficiently today than ever before. The benefits of controlling weeds hardly need to be pointed out because it is common knowledge that these largely useless plants use nutrients, water, and light that would grow plants of higher value.

The losses from weeds in pastures are tremendous and the losses vary greatly from pasture to pasture, making accurate estimates of losses difficult. In one pasture in Nebraska around two-thirds of the total production of plant material consisted of weeds. The 3-year average yield of dry matter, including weeds, in the pasture was 4,214 pounds. Of this, 2,310 pounds were broad-leaved weeds and 701 pounds were weed grasses.

For every pound of weeds grown in pastures the production of more desirable forage plants is usually reduced by an equal amount. This broad generalization varies with moisture conditions and the weed and pasture species involved. If legumes are substituted in the space occupied by weeds the production of desirable forage will be proportionately greater because of their vigorous growth habit and because of the nitrogen fixation that occurs with legumes.

The potentialities of 2,4-D alone, and in combination with cultural practices for controlling weeds in pastures, is clearly indicated in studies that have been conducted at several locations in both the humid and semihumid areas of the

United States. One of these studies was started in the Arthur Hornung pasture south of Lincoln, Nebr., in the fall of 1949. The most numerous weeds were ironweed, false boneset, hoary vervain, many-flowered aster, and annual ragweed. It was found that spraying with 2,4-D was more efficient for control of most broad-leaved weeds than mowing, but the greatest weed control and improvement came from plowing and reseeding to adapted grasses and then giving a supplemental spray with 2,4-D.

Three annual treatments of 2,4-D ester at 1 pound per acre reduced the stand of perennial weeds 70 percent; mowing reduced these same weeds 34 percent while plowing and reseeding plus annual 2,4-D treatments controlled more than 90 percent. Similarly, annual weeds also were reduced in the year after treatment. The sprayings with 2,4-D reduced stands of annual broad-leaved weeds by 66 percent, mowing brought a reduction of 22 percent, and plowing and seeding to grass plus spraying with 2,4-D reduced stands 78 percent.

The amount of vegetation eaten by cattle was increased by all weed control treatments. The treated areas were more attractive to the grazing cattle because unpalatable weeds were greatly reduced and the density of desirable grasses was increased. In the untreated pasture areas cattle ate an average of 1,124 pounds of dry matter per acre, in those mowed 1,346 pounds, in the sprayed areas 1,654 pounds, and in the reseeded and sprayed areas 2,770 pounds



Weed test plots: (center) untreated; (left) mowed about July 1 for 4 years; (right) sprayed with 2,4-D in June for 4 years.

Note.—The author is agronomist, field crops research branch, Agricultural Research Service, Beltsville, Md.

of dry matter per acre was consumed. This means that the treated pastures as listed above, produced, respectively, 20, 48, and 146 percent more edible forage than the untreated pasture.

The above example showed that the greatest and most rapid improvement resulted from plowing and seeding to adapted grasses supplemented by 2,4-D treatment. On tillable pasture this method should be given first consideration. Plowing alone will control many of the perennial pasture species such as ironweed, vervain, goldenrod, asters, yarrow, tall dog fennel, and many others. It is not effective against persistent weeds such as wild garlic, Canada thistle or against brush such as persimmon. However, plowing is limited to land of gentler slopes, and soils relatively free of rocks and other obstructions; thus it cannot be used on a high percentage of the pastureland. In addition, there is a high cost for tillage, seed, and fertilizer usually required for success; also there are frequent failures in obtaining stands, often because of weeds. Incidentally, there are now some new herbicides that show great promise for weed control in establishing forage crops, but space is too limited for discussion of them here.

The use of 2,4-D has several economic advantages over mowing for weed control in areas where a full program for improving pastures is not feasible. In addition to being more effective on many species, control does not usually depend upon as critical timing as is needed with mowing. Thus, more kinds of weeds may be controlled with a single spraying than with one mowing. In addition, ground that has rocks, stumps, and other obstructions can be more easily sprayed than mowed. Also, certain weeds with a low-growing habit cannot be controlled at all by mowing but may be controlled effectively by herbicides.

Legume species vary in their reaction to herbicides. Ladino clover and whiteclover tolerate 2,4-D after they are established, although their growth rate is temporarily reduced. Annual lespedeza may be sprayed with a half pound of 2,4-D amine, if applied after the 6-leaf stage, with only 10 to 15 percent reduction in yield when compared to weed free, untreated lespedeza. This rate of treatment controls many of the weeds that are a problem. When 2,4,5-T



The stand of perennial weeds was reduced 65 percent in 3 years by spraying with 2,4-D once each year.

is applied, lespedeza is eliminated. It is not safe to spray established alfalfa, sweetclover, or red clover with either 2,4-D or 2,4,5-T.

Combinations of spraying and mowing have not been explored sufficiently in pasture weed control. In some areas mowing is desirable for reasons other than weed control. For example, it may help encourage more uniform grazing and favor development of the associated legumes. Where such practices are useful the potential for herbicides has not been fully determined.

If any method of weed control is to be successful it is essential that at least the minimum fertility needs for growing forage plants are met. The objective must be to encourage vigorous growth of forage crops and to fill the space formerly occupied by weeds with plants of higher value.

CONSERVATION COURSES IN SCHOOLS.—"Since today's school children are the public of tomorrow, as part of their education they should become properly informed in the use and development of our natural resources," says Stanley G. Fontanna, dean of the University of Michigan School of Natural Resources.

"How our natural resources are managed depends in great measure upon the decisions of our legislatures—National and State—and the decisions of our governmental administrative bodies," Dean Fontanna declares. "These decisions, in turn, are influenced greatly by public opinion. The better informed the public is, the better will be the results obtained from legislative and administrative bodies."

DISTRICT PROFILE

LONNIE ETHRIDGE of ARKANSAS

WHEN Lonnie Ethridge got a bad knee injury while playing for the Memphis Chicks in 1934, professional baseball lost a promising young rookie. But soil conservation districts, and a lot of other organizations, too, gained a tireless worker.

An all-State college player in baseball, football, and basketball at Arkansas State College, Ethridge left college after his junior year and played baseball and taught school for 3 years. After his knee injury he returned to college to finish his senior year in 1936 and took up a teaching career.

Ethridge was school superintendent at Swifton, Ark., when his wife, also a teacher, inherited a 367-acre farm. He had grown up on a farm in Conway County, so he and his wife decided to give up teaching and take up farming.

A leader in the organization of the Jackson County Soil Conservation District 6 years ago, Ethridge has served as a district supervisor from the beginning. He has been a member of the board of directors of the Jackson County Farm Bureau for 10 years and served 2 years

as its president. He has also served as a member of the county Agricultural Stabilization and Conservation Committee.

Better land use in the district program has meant more pastures and more livestock. Ethridge is secretary of the livestock association at Weldon.

On his own farm, Ethridge has a herd of 72 Angus cattle. His 130 acres of permanent pasture is in ladino clover, lespedeza, fescue, and common bermudagrass. He uses oats for supplemental grazing in the late fall, winter, and early spring. Last year he used only 350 bales of hay, 8,000 pounds of cottonseed hulls, and a ton of cottonseed meal for his 72 head of cattle and some calves.

Farm crops include corn for hogs, milo for hogs and cattle, soybeans, and cotton. Ethridge follows all this cotton with vetch or oats and vetch. On a 12½-acre field in 1956, he harvested 10,000 pounds of vetch seed and 500 bushels of oats, and followed with a summer crop of milo. He pastured the oats for 2 months in the fall and 1 month in late winter. Oats and vetch were reseeded in the milo about September 1.

Ethridge has found that the best insurance against drought is irrigation. He has used furrow irrigation on cotton and soybeans for several years. Although his land is not level, he has recently developed a satisfactory system of flood irrigation. He plans to do some land leveling as rapidly as he can afford it.

In his present system of flood irrigation, worked out with the help of Lyle Bobeck, Soil Conservation Service work unit conservationist, he runs a dike on the contour at 0.3 foot vertical interval. Using a dike disk behind a farm tractor, he builds the dikes 6 feet wide and 1 foot high. He tries to keep the area between the dikes down to 2 or 3 acres. Last year he put three 4-inch applications of water on his cotton and soybeans.

Along with his farming operations and other agricultural activities, Ethridge has continued his interest in education. He is a member of the Governor's Advisory Committee on Education, president of the Arkansas State School Board Association, and president of the Newport school board. For the past 14 years he has taught a Bible class at Weldon.



Lonnie Ethridge.

"People ask me why I do all this free stuff," he says. "'Well,' I tell them, 'if somebody doesn't do it, it just won't get done.' I have an 11-year old son and if there is one thing we can do for the kids, it's give them a good education. I want to do my part to see that they get it."

—BARRINGTON KING

STUBBLE-MULCH FALLOW ON SANDY SOIL

A versatile Nebraska farmer increases crop yields and protects his soil through stubble-mulch fallow with partially homemade machines.

By BILL STUART

BY hard work, imagination in building his own machinery, and a curiosity that leads him to look for a better way to do things Dick Walker, who farms in Nebraska's Panhandle near Gordon, has changed a low-yielding farm to one of the most productive in the area. He has done this in 6 years, with limited capital, on sandy cropland that is extremely susceptible to wind erosion.

Walker says his system of stubble-mulch fallow is mainly responsible for his increased yields and improved soil productivity. His home improved implements enable him to farm more efficiently.

If any machine that Walker uses does not suit him he brings it into his shop, tears it down, and rebuilds it until he has a machine that fits his particular use.

The machine that Walker uses, most of the time, for working his fallow ground has a tool bar frame on which the width can be changed to fit various operations. This machine is equipped with 18-inch sweeps and rolling colters. He also uses a one-way plow and a power-



Wide-row corn on the Dick Walker farm with summer fallowed land between corn rows.

driven, center drive rod weeder. He drills his wheat with a chisel drill equipped with rolling colters.

One of the fields that was observed, on which there was a heavy mulch, was being worked for the last time before being seeded to wheat. Walker explained the operations that he had carried out on this field. The first operation in the spring was to go over the field with the sweeps, and the second operation was with the one-way plow, just deep enough to kill the weeds. The third operation was with the sweep, and the last one or two operations with the rod weeder.

Ordinarily no work is done in the fall to winter wheat stubble because in this area the average snow pack in the winter months is 53 inches. If all of this snow, which usually comes with a heavy wind, is deposited on the fields it means about 5 inches more moisture in the ground than on those bare fields where the snow blows off. Walker says he is going to try working some of his stubble fields in the fall with a 30-inch sweep machine to kill weeds and



Dick Walker examines winter wheat planted between wide rows of corn.

Note.—The author is work unit conservationist, Soil Conservation Service, Rushville, Nebr.

PRACTICAL TRAINING

By BURTON W. DeVEAU



Stubble-mulch fallow a month before wheat planting time on the Walker farm.

volunteer wheat. This should leave stubble standing to catch the winter snow.

Walker's main problem when he first started fallowing several years ago was that he did not have any stubble to work with so he had to do something else until he got a crop or two of stubble to work as a stubble-mulch fallow. In order to do this he planted wide rows of corn, 13 feet apart. He summer fallowed between the rows.

The wide-row corn was listed, and cultivated with a tender until the rows filled in and then the sweep machine was used to cultivate between the corn rows. In September, winter wheat was drilled between the corn rows with a 12-foot drill. Walker found that the wheat planted between the wide corn rows yielded about 25 bushels per acre while his stubble-mulch fallowed wheat was averaging 30 bushels to the acre. The corn in the 13-foot rows yielded 10 bushels to the acre.

A cooperator with the Sheridan County Soil Conservation District, Walker has done an outstanding job of protecting his sandy cropland from wind erosion. Besides his wheat farming operations, he raised this year 80 acres of rye and 40 acres of winter barley. He has a herd of 25 range cows and 25 steers that run on 400 acres of native grass.

THE training of university students in specific, practical aspects of farming is a difficult task. Some of the training may be provided on the university farm. Conditions on the university farm and facilities, however, are not average situations. Even if they may be average the conditions soon become well-known among students and this adds to the difficulty of providing practical training situations. This is particularly true in training students in farm planning.

The agriculture department of Ohio University at Athens, has attempted to solve this problem by providing practical experiences for its students with the cooperation of the Athens Soil Conservation District. All students in the general agriculture and soil conservation curricula are required to take a course in farm management in their senior year. In this course they are required to plan a 5-year farming program for a specific farm in the Athens area.

This class is divided into committees composed of 3 or 4 students. Each committee is assigned a separate farm. The farms are

Note.—The author is chairman, department of agriculture, college of commerce, Ohio University, Athens, Ohio.



Left to right: Professor DeVeau, students James Olinger and Arthur Jones, and farmer Max Crabtree discuss Crabtree's conservation plan.

selected according to the following criteria: (1) The farmer must be a cooperator with the Athens Soil Conservation District; (2) the farmer is willing to cooperate and assist the committee assigned to his farm by providing necessary information, such as: past practices, future plans, and available financial resources; (3) the farmer has not had a complete farm plan formulated, or he wants to change his present plan.

This method of instruction has been in operation 4 years. Different farms have been selected each year. There has been no difficulty in securing the cooperation of farmers.

The Soil Conservation Service cooperates by assisting in the selection of farms and providing access to soil and field layout maps of the selected farms. Technical advice is also provided at times.



Students take soil samples for testing.

The students are given careful instructions concerning their activities at the farms. The instructor accompanies the committees during their first few visits to the assigned farms. Then, the committees work with the farmers in developing a 5-year farming program. At the end of the semester each committee is expected to submit a written plan to the instructor and to the cooperating farmer. Members of each committee describe their plan to the rest of the class at the assigned farm in the presence of the farmer.

The 5-year plan is expected to include: (1) A general description of the farm including loca-



Students measure the slope of a field.

tion, topography, farmstead, etc.; (2) a general description of the proposed 5-year plan; (3) a soil map; (4) soil test results for each field; (5) present and proposed field layout maps; (6) present inventory; (7) proposed inventory at the end of 5 years; (8) a cropping and reforestation plan for each field for every year in the plan; (9) expected crop yields each year; (10) amount of livestock and poultry that should be raised each year; (11) breeding practices; (12) total feed requirements for livestock and poultry each year; (13) total amount of crops that should be sold; (14) total amount of feed fed to livestock and feed purchased each year; (15) seeding mixtures and rates; (16) conservation practices to be adopted on the farm each year; (17) fertilization practices to be followed on each field every year; (18) building and fencing plans for each year; (19) expected machinery and equipment purchases; (20) use of labor; (21) marketing procedures; (22) expected income and expenses; (23) expected credit transactions; and (24) all other information pertinent to the successful operation of the farm.

This method of instruction accomplishes several objectives. It serves students by providing a practical farm situation to gain supervised farm planning experiences, giving an opportunity to work with others—students, tech-

nicians, and farmers, providing an opportunity for oral and written expression, and allowing him to compare theoretical knowledge, ideas, and experiences with others. It serves the co-operating farmer by providing him with a well balanced 5-year farm work plan utilizing his ideas and giving him experience in sharing ideas and knowledge with others. It helps the university by promoting better public relations. It helps the instructor by keeping him informed of the present practices in the area and enabling him to have experiences in working at the grass roots level. In other words, this cooperative venture in education not only serves students but serves the Athens Soil Conservation District, the university, and the entire community.

ARE BLACK DAYS AHEAD?

(Continued from page 149)

The poorer lands produce good yields only in years when we do not need the production. On such lands, we should make sure that agricultural programs work together and not at cross purposes.

Finally, one of our really big advantages over the situation of the thirties is the help and backing of our soil conservation districts. Their work is a tremendous factor in the success of our present conservation program. With their guidance and influence, plus the actual help they are giving to the many thousands of co-operators in Kansas, we can count on rapid progress in solving this problem.

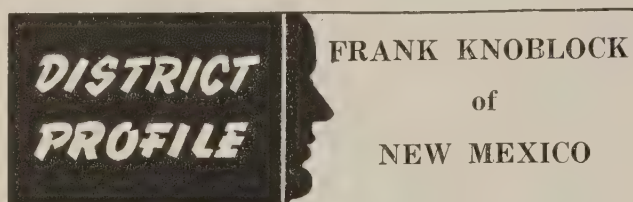
CONSERVATION ON TAIWAN

(Continued from page 159)

from farmers and Government-owned agricultural corporations for information and help in establishing soil conservation measures.

For example, both financial and technical help has been given to the Taiwan Power Company in establishing better conservation measures in the watershed of its Wusheh Reservoir. Taiwan Sugar Corporation asked and received technical help in solving erosion problems on several of its plantations. Technical advice was given to the Tachiachi Watershed Development

Commission, which is planning the multiple-purpose development of one of Taiwan's largest valleys, and to the watershed construction committee for Shihmen Dam, just being started with ICA aid, and already being labeled the TVA of the Far East.



FRANK KNOBLOCK has been the driving force behind the Socorro Soil Conservation District board of supervisors since 1947. That was the year he became a member of the board. He has been chairman of the board since 1948. His leadership and cooperation with the First State Bank resulted in three annual Banker's Award Programs.

The Socorro Soil Conservation District was host to the annual meeting of the State Association of Soil Conservation Districts in 1954. In 1955, Frank was selected the best supervisor in the State, and was presented a bronze plaque.

In the past 4½ years, Frank has missed only 2 supervisor meetings. He was largely responsible for the purchase of district cooperation signs by individual cooperators. The board also purchased and put up 4 district boundary signs.



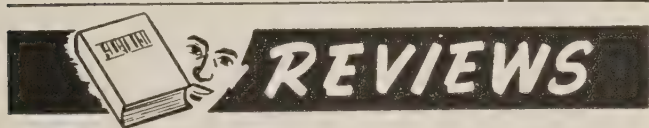
Frank Knoblock.

Frank put up 3 of these with the help of his hired man. The Socorro District placed second in the State in the 1954-55 Goodyear Contest.

Knoblock's leadership in the Lion's Club, Game Protective Association, County Fair Board, Middle Rio Grande Conservancy Board, and the Farmers Home Administration county board has been outstanding. He is a member of the Farm Bureau and the New Mexico Cattle Growers' Association.

He was born and reared in Socorro County, and served as sheriff for 6 years. His wife is a teacher in the Luis Lopez Grade School. He has completed more than 90 percent of the planned conservation work on his ranch and farm. His program involves proper grass management and deferred grazing on his 12,371-acre ranch. He farms 37 acres under irrigation, on which he practices crop rotation and improved irrigation. This acreage has been leveled, and 53 irrigation structures have been installed on it.

—E. O. HILL



WATER FOR AMERICA. By Edward H. Graham and William R. Van Dersal. 112 pp. Illustrated. 1956. New York: Oxford University Press. \$3.50.

THIS book is a fit companion for two previous books of the same type and by the same authors, "The Land Renewed" and "Wild-life for America." It is written in a style that makes it readable and interesting for children from the fifth grade up, and also interesting and informative for adults of all classes. The 55 full page photographs are outstanding and dramatize and enhance the factual material.

The subtitle, "The Story of Water Conservation," accurately expresses the aim of the book, but hardly gives a complete picture of the contents. In a topical presentation the authors discuss the importance of water, where it comes from, how it is used, how it might be used, water rights, water damage, and water power, as well as how water may best be conserved.

The first half of the story deals mainly with the importance of water and how it affects our lives. The last half tells, in simple but effective terms, what we should do to assure a permanent supply of good water for the United States. Drainage, irrigation, flood control, farm ponds, farm water-disposal systems, and water for wildlife are just a few of the topics discussed.

This is a book that should be in all school libraries and in all other libraries where readers may have a need for concise and accurate information about 20th century water problems of the United States.

—TOM DALE

GRASSES AND DRY FARMING.—Luther Shields, a dryland farmer and a member of the board of supervisors of the Dolores (Colo.) Soil Conservation District, told me the other day, "I have made more money from acreage planted to grass than from a like number of acres planted to either beans or wheat."

Shields owns and operates a 160-acre farm where the annual rainfall is 17 to 19 inches. Using the generally employed farming practices, he saw his topsoil being eroded away from the sloping fields and gullies in his drainageways getting larger. He realized that if he was going to stay in business he was going to have to change his farming practices. He knew that to successfully dry farm his land, he would have to hold and store in the subsoil the maximum amount of winter moisture that fell on the land.

In 1950, Shields discussed his problems with Soil Conservation Service technicians working in his district, and together they developed a conservation plan of operations. He knew that farming on the contour would involve more work, but he was confident that by so doing, he could stop the loss of his topsoil and store more moisture in the subsoil.

The first operations were to make a soil survey and a design of the farm for contour farming. When the survey was completed and the contour design decided upon, guidelines were staked out and marked. The terrain on the farm is variable and several areas would not fit into the contour pattern. These areas were planted to intermediate wheatgrass.

The gully in the main drainageway was filled in and shaped so it could be crossed with farm implements. The entire waterway was then seeded to grass to tie the soil down and help catch soil washed down from farms higher on the drainage.

A pond was constructed to provide stock water at the lower end of the grassed waterway. Since the construction of the pond, Luther has been able to keep a few head of livestock which has made it possible for him to provide milk and beef for the family.

Typical of all dryland farms in Montezuma County, the crop rotation is pinto beans, wheat, and summer fallow; but Shields also fits grass into this rotation for 3- or 4-year periods. With the past and present prices of beans and wheat, Luther says that he has made more money from the grass acreage than from beans or wheat.

With contour farming, grassed waterways, livestock water development, and grass in his rotation, Luther feels that he is keeping his farm productive and saving it for the next generation. Luther has often said, "There is more to this dryland farming than just planting and harvesting."

—CHARLES E. REAGAN

EVERYBODY'S BUSINESS.—The Greene County Soil Conservation District in southwest Ohio has a very active board of supervisors. But a great part of the success of the board's cooperative work can be traced to its program committee. This committee is composed of leading farmers, bankers, contractors, implement dealers, grain dealers, and businessmen. It holds an annual planning meeting each December to which a representative from all farm agencies and organizations are invited. These include the Soil Conservation Service, Vocational Agriculture, Extension Service, Agricultural Stabilization and Conservation Committee, Production Credit Association, Farmers Home Administration, Grange, Farm Bureau, Rotary, Kiwanis, Sertoma, Garden Clubs, and the Xenia Chamber of Commerce. School officials and county commissioners also participate.

The annual meeting provides an opportunity for all these organizations to get together and plan activities for the following year. The group elects its own chairman who leads the discussion in analyzing the last year's program. This helps in planning activities for the new year. At this meeting the committee selects the leader for each activity. The organizations like this method because it shows them what activities are needed in the district and how they can best help. They then can prepare in advance for the events. Even though a representative does not participate, he learns the needs and activities of his county. Thus, the farmer-elected board of supervisors of the Greene County Soil Conservation District, giving its time and effort with-

out pay, makes an ideal group around which all agencies can unite.

Under this program, the personnel of the SCS, assigned to the Greene County District, spend more of their time in applying soil and water conservation practices on the land. The well planned program of sharing the educational work assures the district of an informed public and also allows SCS technicians more time for direct assistance to farmers.

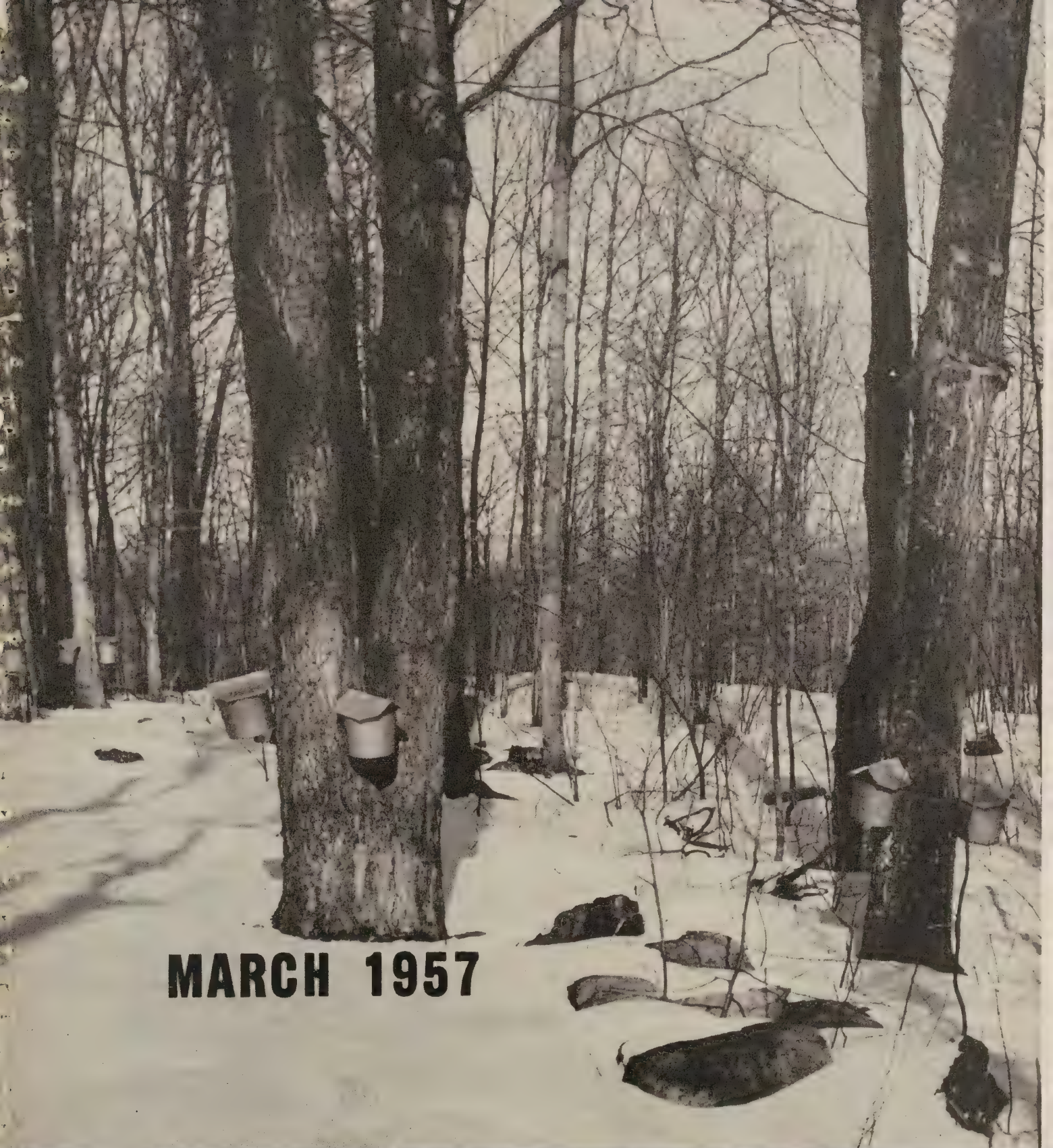
In the Greene County District there is at least one major conservation activity each month. During April, which is designated Conservation Month, however, an extensive educational program is conducted.

The first activity in April 1956 was the FFA land judging contest. Every FFA member in the county, about 180, took the "two-hole" competitive course in land judging. The district provided standard medals for the 3 high winners from each chapter; it also gave a large trophy to the chapter with the 3 highest scores.

The supervisors were very pleased when 320 school teachers dismissed school to go on a conservation tour. The teachers traveled from one farm to another where technicians explained the value of different conservation practices. The county and city superintendent of schools cooperated in arranging for this rewarding day. The Borden Company provided free milk. The Xenia Gazette sent one of its feature writers to get a story and pictures. To give each teacher some homework, the Soil Conservation Service and Extension Service provided packets of booklets and pamphlets.

When the poster contest was announced, the county garden clubs initiated the contest in the fifth and sixth grades of each school. George Barton, secretary of the Chamber of Commerce, asked all merchants to let the children display the posters in store windows. The Sertoma, Kiwanis, and Rotary Clubs provided trophies for the first, second, and third prize winners, and the Greene County Soil Conservation District gave an attractive certificate to each student who participated. The Citizens First National Bank and the Dayton Power and Light Company were active supporters. Each displayed large conservation exhibits in its lobby.

Conservation Month is only a small part of the many educational activities in the Greene County District. Walk into any prominent business place in the county and you will find that the proprietor is familiar with the district conservation program. As one merchant put it, "We realize that if the time ever comes when our soil will not provide enough food for all, the farmer will eat at the first table and we will eat what is left."



MARCH 1957

Soil Conservation

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION.

EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

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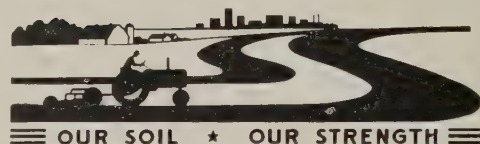
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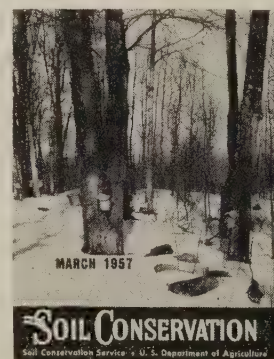


AGRICULTURE IN BRITAIN.—Agriculture is one of Britain's largest and most important industries, employing three-quarters of a million people and using about 48 million of the 60 million acres of land. Output is now more than 50 percent higher than before World War II. Production of cereals is 80 percent higher. Britain now produces 50 percent of its bacon needs as compared with 30 percent prewar, and nearly 70 percent of its meat supplies, compared with 50 prewar. Yet, about one-half of Britain's total food supplies (including coffee, sugar, tea, cocoa, etcetera) still have to be imported.

—British Information Service

GRASS SEED TO SOUTH AMERICA.—The United States exported more than 2.3 million pounds of grass and legume seeds to South America during the 1955-56 crop year. Chile and Uruguay were the largest buyers, and all the South American countries, except Paraguay, imported some.

Editors are invited to reprint material originating in this magazine.



FRONT COVER.—Sugar maple grove at maple syrup time. (See article on opposite page "Sugar Bush Conservation.")

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Sugar Bush Conservation

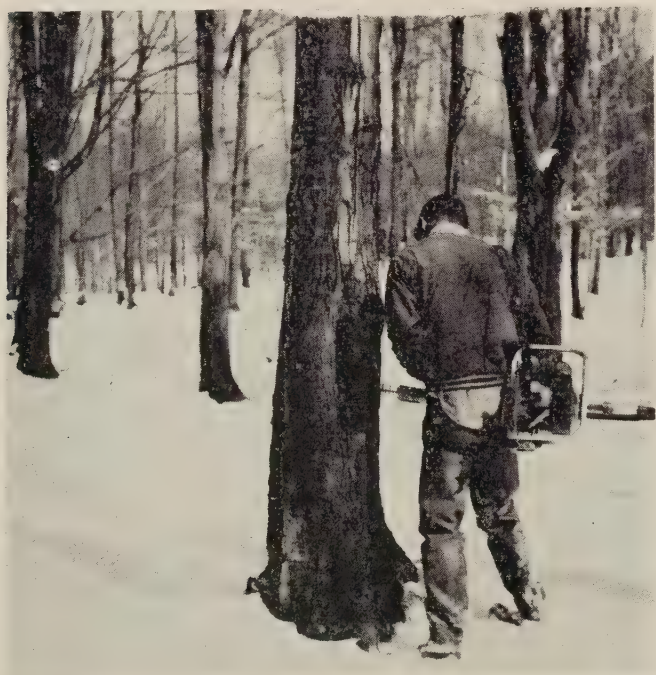
By JOSEPH KRIVAK

THERE'LL be a lot more sweetness in Erie County, Pa., when maple syrup time comes in March. Then activity reaches a high pitch. Many farmers work 16 hours a day harvesting their first farm crop of the new year. Erie County's annual syrup production is 20,000 gallons, 20 percent of the State's output. At today's prices this gives the county a hundred thousand dollar income.

The sugar bush comes to life when the sun's rays break the siege of old man winter. Temperature formulas notwithstanding, persons running a bush know the smell and feel of the first run. Buckets and spiles are checked, the woodpile is made ready, and the horses leave the barn.

Old dobbin has held his position in this farming operation. There are still 3,000 horses on Erie County farms. Many of these earn their keep during the sugar season. A team of well-trained horses greatly increases the speed of setting up the bush and gathering the sap.

Note.—The author is work unit conservationist, Soil Conservation Service, Erie, Pa.



Harry Burrows tapping a sugar maple.



Sugarhouse of Arthur Harwood.

Modern methods and long used practices mix agreeably in the sugar bush. Tapping the tree with a power rig, beats hand drilling. With a power drill, it is a 2- or 3-second job. The spout is driven, bucket and lid hung, and the sugar bush is in business. That is, after this tree-by-tree process has been repeated from 500 to a few thousand times.

Then, the weather becomes ruler of the sugar bush. Anyone who makes a living from nature, be it farmer or fisherman, is keenly weather conscious. Among the weather conscious farmers, sugar makers rank high. With cold nights and warm days, the sap plink-plunks into the buckets and is soon ready for the sugarhouse.

The next job is to get the sap to the sugarhouse. Anyone who has carried a full sap bucket in a foot of snow knows this isn't easy. The trusty team of horses pulling a sled with a mounted tub is the most common sight. When topography permits, gravity systems of pipelines make the job easier. For every 35 gallons of sap going into the sugarhouse, only 1 gallon comes out as syrup.

Horses may still be used to collect the sap, but mechanization is catching up with sugarhouse operations. Harry Burrows, the largest



Sugar bush of Arthur Harwood at maple syrup time.

producer in these parts, doesn't have a woodpile anymore. He switched over to oil-fired evaporating pans. "This beats throwing chuck wood," he explains. "All I do now is turn a valve. I save time two ways. There is no woodpile to get ready beforehand and don't think cutting 20 cords of wood isn't work. Then, I can boil down in half the time. No more working all night in the sugarhouse for me. Controlled heat has other advantages too. The syrup comes out not only faster but lighter in color. That's Fancy grade syrup."

Arthur Harwood, Wattsburg, operates a 75-acre bush. "I manage my sugar bush for high production," he states. "Like my dairy herd, it's the individual producer that counts. You can't get good pasture and a good sugar bush from the same land. You wouldn't expect your cow to be a good milker unless she was cared for. Well, the same applies to a maple tree."

Dale Forbes, a director of the Erie County Soil Conservation District, hangs 2,000 buckets in his sugar bush. He likes to talk about sugar bush conservation. He says: "The first thing I did when I bought the farm was to fence out the cows. Now I've got a stand of young maple trees. I've noticed many old sugar bushes that have quit producing. Twenty years ago they were among the finest in this area. If the trees had been treated half as well as the cropland

on those farms, they would still be putting money in the farmers' pockets. A little commonsense and conservation could have saved those bushes. Now, even the sawmills don't want them."

Water Is Their Life

Community irrigation systems, in use for centuries, have recently been improved by modern conservation irrigation engineering.

By PHIL LOVATO

THE success of a small farmer in the irrigated valleys of the Eastern Taos Soil Conservation District, in northern New Mexico, depends upon how much irrigation water he gets and how well he uses it. For more than 300 years community irrigation ditches, or acequias as they are known locally, have furnished the water needed to irrigate fields of corn, wheat, alfalfa, and pasture. These acequias carry water diverted from the numerous mountain streams originating in the snow covered areas of the Sangre de Cristo Mountains.

There are about 150 community ditch systems in the Eastern Taos district and proper management of water for irrigation is essential to the economic life of most of the 12,000 inhabitants. What has been done to build and improve these ditch systems is a story of possibly the oldest cooperatives in the country. It is a story of what the Spanish colonists of the 17th century did with practically no tools and a great amount of patience. It is a story of the slow but gradual change to more modern methods and irrigation structures.

Spanish settlers of the 17th century developed their communities along the numerous river valleys. Records indicate that they immediately started building their ditches, and as the com-

Note.—The author is work unit conservationist, Soil Conservation Service, Taos, N. Mex.

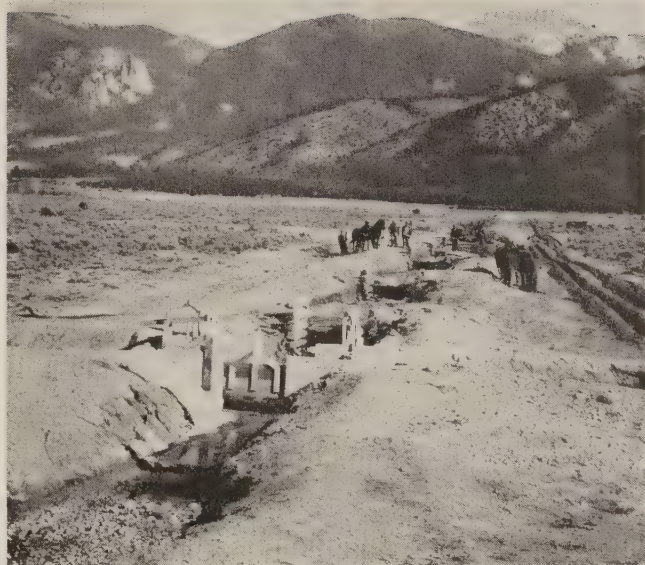
munities grew the old ditches were made longer and new ones built. These acequias were for the benefit of all inhabitants of a village. Each man had an equal vote in matters pertaining to the irrigation system and each contributed labor or cash according to the amount of land he irrigated. Once a year water users in each system got together and elected three landowners to take charge of their irrigation system, and a ditch boss or majordomo to supervise the work and distribute the irrigation water.

The original ditches were laid out without the use of surveying instruments by allowing a trickle of water to follow along the flattest possible grade. How successful this was is attested by the fact that most of these ditches have remained in the same locations throughout the years.

But the irrigation water had to be diverted from streams that sometimes triple in size during the spring runoff or during summer flash floods. And the ditches had to be carried across arroyos and around steep hills.

Across the streams they used brush and rock dams that had to be rebuilt sometimes two or three times a year due to damage by floods. Across the arroyos, the settlers placed flumes made of tall trees hollowed out by hand. But erosion widened the arroyos and often the log flumes collapsed. Then, too, the streams flow in abundance in early spring when moisture is plentiful in the irrigated valleys. But the water supply gets short during the irrigating season.

These conditions created real problems for



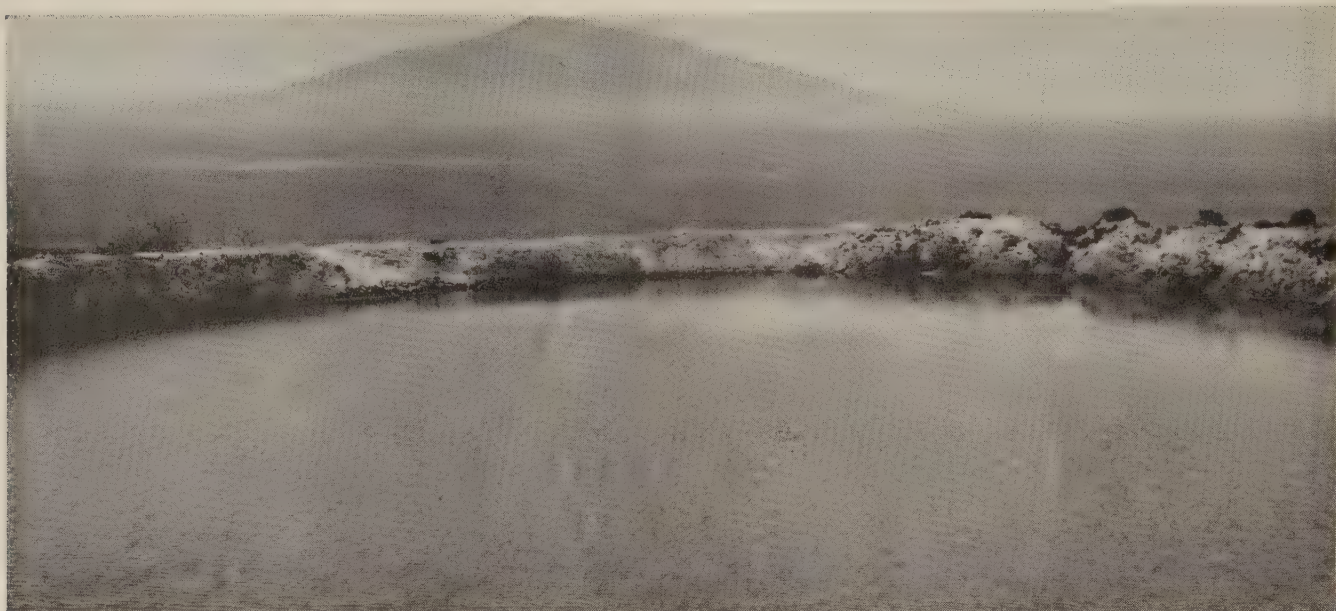
Check drops to control erosion under construction in an irrigation ditch.

most communities. A great amount of time had to be spent by each water user in repairing the rock and brush diversion dams, the flumes, and the main ditches. Manuel Rodrigues, a farmer and majordomo of the Chamisal community system, estimates that \$6,000 worth of labor alone was needed each year, before improvements were made to keep the system in working order. Besides this, irrigation water had to be cut off during the critical irrigation period.

Some of these conditions still exist, but community leaders have been doing something about them. When the Eastern Taos Soil Conservation District was organized in 1941 they prevailed upon district supervisors to give high priority to this part of their soil and water conservation program. This was done, and an intensive program was started by the district board and the ditch commissioners of the community systems. Soil Conservation Service technicians, assigned to the district, did the designing and planning. Water users built semi-permanent log-crib or more permanent concrete diversion dams. Structures for metal flumes were built to replace the old leaky log flumes. Rock and brush structures were constructed to control erosion and prevent widening of arroyos where the ditches cross. To obtain the best use of the water when the supply is short, more than 140 overnight storage reservoirs were built.



Farmers in the Taos Soil Conservation District working to replace wooden flume with one of metal.



Overnight storage reservoir in the Taos Soil Conservation District.

This phase of the conservation work of the district and community ditch systems has continued though not in as high priority as when the district was organized. A large portion has been completed. Since the two organizations got behind the program, 100 ditch systems have participated. The following have been constructed: 23 permanent diversion dams, 20 metal

flumes, about 200 large diversion headgates, and more than 500 small erosion control dams.

The work has been done by the water users themselves, and it has taken a lot of time and labor. But the improvements are paying off through less annual maintenance and assurances of a more efficient delivery of irrigation water to their farms.

Is History Repeating?

The people of Greeley County, Kansas, in the heart of the Dust Bowl, find themselves confronted with much the same situation as 20 years ago.

By FRED J. SYKES

HISTORY shows signs of repeating in Greeley County, Kans., along the western border of the State. The fight against wind erosion is shaping up. The lines are drawn. It is a fight the citizens of Greeley County expect to win just as they did 20 years ago.

The scene now, to some of the oldtimers like Jess Taylor, is much like it was in the thirties when drought and wind teamed up to whack at the land and people with merciless blows. He considers it pretty much a renewal of the cam-

paign he helped to lead in the dry years two decades ago.

Taylor is now a member of the Kansas House of Representatives where last year he was chairman of the agricultural committee. He came to Kansas from Texas' high plains in 1930 and bought 320 acres of land southwest of Tribune.

Yields in 1931, Taylor recalls, were mighty good—too good, in fact. The flood of grain throughout the wheat country broke the market to giveaway lows. Farmers couldn't get enough for their crop to pay costs. Taylor remembers that after paying expenses he had \$300 left. He was better off than most.

Note.—The author is state conservation, Soil Conservation Service, Salina, Kans.

Then the dry years started. Crops failed to make growth to protect the land. The blowing began and got worse and worse.

In 1936 Greeley County citizens decided to act. They could do something about the blowing—and would. They chose Jess Taylor to head their committee on planning.

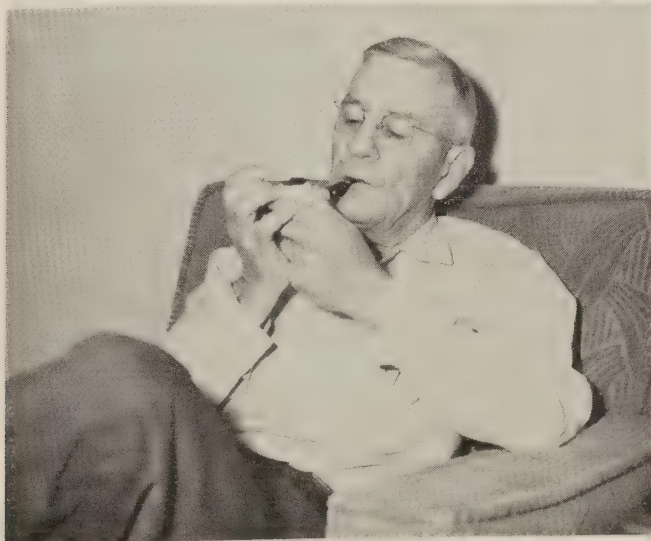
Taylor had served on the Agricultural Adjustment Administration committee for his county. He was widely known as a man who knew the agriculture of the Plains. He had a way, too, of breaking problems down to solvable parts. He had the confidence of the farmers of the county.

Leaders of agricultural agencies and organizations made up the committee. The first step was a series of meetings to explain the problem. The help of everyone was needed. The immediate problem was to get all cropland under emergency tillage.

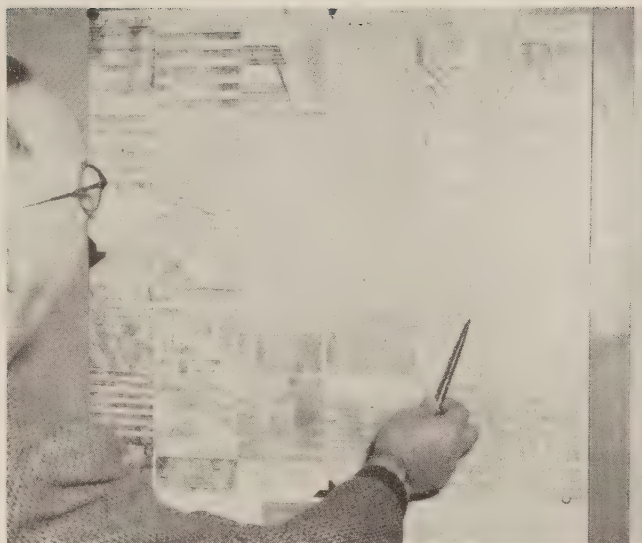
Lack of equipment was a handicap. The committee decided on a hurried check of all equipment in the county that would be useful. There were too few tractors, and fewer listers and chisel-type tillage tools. But they made good use of what they had.

The county AAA committee, with Harry Ridlen as chairman, wrote to every landowner who lived outside of the county to explain the situation. Absentee owners were asked to cooperate by leasing their land to local people. Federal funds paid 25 cents an acre for the tillage done.

Only six owners refused, Taylor recalls. But in these cases Kansas' "soil drifting" law,



Jess Taylor.



Aerial photograph shows stripcrop patterns for a part of Greeley County.

passed 3 years earlier, was invoked. The law provided for doing the needed tillage, the cost to be assessed along with taxes against the land.

The mass tillage started at the southern edge of the county. All available equipment and manpower was put in action. It moved slowly northward. Well before the period of hard blowing arrived, the job was done.

The AAA committee made stripcropping a requirement for Federal help of any kind. Ten to twenty rods of wheat or sorghum, and a similar strip in fallow was the pattern. It worked wonders. Many farmers kept on with it when better years came. It is making the new fight an easier one.

Is history repeating?

"Yes, to a certain extent," Taylor agrees. "We have much the same problem. We have had several meetings already. Nearly all the cropland has been chiseled or listed for emergency protection. The Agricultural Stabilization and Conservation Committee has set up a \$2.50 an acre payment for stripcropping. Our soil conservation farmers have been making good use of what crop residues they have been able to grow."

Some of this is obviously due to the work of an organization that wasn't there before. It is the Greeley County Soil Conservation District. Battling wind erosion is one of its main objectives. M. A. Tucker, who farms near Tribune, is chairman of the district board. He is the board's representative on the county planning committee.

"We'll come through this fight in better shape than we did before," Taylor promises. "We know more about the job. Most of our people, instead of being broke and discouraged as they were before, now have money in the bank to tide them through, and our farm equipment is better and we have more of it. They believe in this country, too. The Federal Government is backing us now with the technical help we need as well as with cash. ACPS and the Soil Bank are big factors in our favor. Yes, the scene is different now."

The fields of Greeley County show Taylor is right: the stripcropping, the thousands of acres of crop residues, the grass on the thin and eroded soils. Greeley County is going to win this time, too, although there is a big job ahead.

FARM PONDS ON THE VIRGIN ISLANDS

Farm ponds on St. Croix, the largest of the Virgin Islands, have helped solve the livestock water problem and rejuvenated wells and springs.

By ALFRED H. OVESON

ST. CROIX, the largest of the American Virgin Islands, is slightly more than 22 miles long in an east-west direction, 6 miles in width at the widest portion, with a land area of about 82 square miles. The island can be divided into 4 important sections according to its physiographic features: (1) The northwestern mountain area, (2) the southwestern and south central coastal plain, (3) the north central hilly area, and (4) the eastern mountainous area.

The mountain areas include land that has sufficiently gentle slopes to allow cultivation. The northwestern area has many small valleys adjacent to the coastal plain. Natural drainage in the mountainous area ranges from good to poor.

The natural vegetation varies in the different sections. The northwestern area has fairly



Newly constructed pond on St. Croix, V. I.

dense tropical forests. The central and southern sections are covered by hurricane grass, which is considered an inferior type of pasture grass. The eastern section is covered by thorny brush and cactus.

The average temperature is about 78°. The total precipitation varies greatly in the various areas, and from year to year. The rainy season usually starts in September and ends during January. Small showers sometimes fall during April, May, and June. The heaviest rainfall is found in the northwestern wooded areas, with averages from 45 to 60 inches. The southern and eastern areas usually average from 5 to 20 inches of rainfall a year. In the central area where most of the fertile lands are found, the rainfall ranges from 20 to 40 inches.

The prevailing winds sweep the island lengthwise from an easterly to westerly direction. Evaporation has been calculated to be 72 inches a year in the exposed areas.

Water for human consumption is obtained by collecting rainwater in cisterns from the roofs of houses. For livestock, wells have been dug to a depth of 100 feet or more.

With rainfall unevenly distributed during the year, livestock suffer immensely during droughts. Test drillings for artesian wells, made in 1940 and 1941, failed to find sufficient water stored in caverns below the ground. Depths up to 1,506 feet, dug by a rotary drill, showed the quality of the water to be salty and unfit for use by livestock. Most of the ground water contains a moderately high mineral content.

Note.—The author is conservation aid, Soil Conservation Service, Christiansted, St. Croix, V. I.

During heavy rains most stream beds carry a full flow of water and discharge it into the sea. Practically all of the streams are intermittent. The streams in the northwestern area flow for many months after the rainy season, due to their being fed by springs. In the eastern area, due to lack of sufficient rainfall, they flow for only a limited time after heavy rain-falls.

Well water is generally used solely for domestic purposes and not for human consumption. A few wells, which produce a fairly good quality of water, are occasionally used for drinking purposes by the farm folk.

Due to prolonged droughts and poor condition of pastures, the situation became grave and many animals died for want of food and water. Dug or drilled wells failed to produce sufficient water to tide them over droughts, and many farmers decided that they would have to quit raising livestock.

With the formation of the soil conservation district, this critical situation was discussed. In the meantime, four small earth ponds were built by the Works Progress Administration and the Soil Conservation Service in 1941. These ponds, though small, were a godsend to the farms on which they were built. They not only

furnished sufficient water to the farms but other farmers' livestock were saved by hauling water from the ponds. The opinion of many farmers, at that time, was that the earthen dams would be washed away at the first heavy rainfall. Today they are still in excellent condition and are furnishing water to a group of farmers.

This initial pond construction being so successful, a few other farmers decided to invest in the construction of farm ponds. The Soil Conservation Service was asked to assist the farmers in locating sites, staking out, and supervising their construction.

Machinery for construction consisted of bulldozers and earth pans. Under the Agricultural Conservation Program farmers participating in this were paid on an earth moved basis of 12 cents per cubic yard.

During 1946-47, on the farm of Ward M. Canaday, 5 ponds were constructed in various sections, ranging from a capacity of 2 million to 4½ million gallons of water.

Contour furrows, also, were laid out and cut in pastures to save the water from rushing down the slopes into the stream beds.

With these ponds filled to capacity, it was noted that many wells that were dry for years, were rejuvenated to the extent that some of



Pond near Christiansted, St. Croix, constructed in 1952 and stocked with fish.

them overflowed. Streams were kept flowing for longer periods, too.

With the results seen from so few ponds constructed, the district supervisors, the Soil Conservation Service, and the Virgin Islands Corporation, with the assistance of many livestock raisers, formulated a plan. This plan called for the construction of approximately 150 farm ponds, plus land clearing of undesirable brush, and was presented to Congress in 1949.

This overall plan met the approval of Congress and outright grants were made to carry out the program.

The district supervisors met and scheduled 10 ponds at a time for construction in an area. SCS technicians located the most desirable pond sites, made surveys of soils for building materials, and technically supervised the construction.

By August 1956, a total of 77 ponds had been constructed under the program.

The smallest pond constructed has 0.2 acre-feet, or 60,000 gallons capacity, and the largest has about 95 acre-feet or 30 million gallons capacity. Approximately 547 million gallons will be stored in all ponds now on St. Croix.

Most of the ponds not only furnish water for livestock but also serve as fish ponds. After completion, and as soon as a pond is filled to capacity, it is checked often to see if it will hold water. As soon as a pond keeps a constant level of water, small blackmouth bass, bream, and minnows are placed in it to furnish food for the table of the farmer, and for sport fishing.

The construction of farm ponds in the highlands made it possible for vast quantities of water to be stored underground due to some seepage. Many small streams that had not flowed for years, suddenly started to flow and many springs became active. The low lying lands, too, showed a vast improvement due to the underground flow of water. Many wells that produced salty or brackish water, were vastly improved, some to the extent that farmers get their home supply from them.

The farmers are proud of their ponds. They like to show the ponds to their friends, tell of their capacity, what fish is used to stock them, and, as usual, the size of the "one that got away."

The water situation has been solved somewhat by farm pond construction, improved pastures, and proper management of the farm.

There are still many ponds to be constructed, however, and it is hoped that eventually all runoff from the mountains will find its way into ponds. This is the wish of the farmers of this beautiful island.

A STUBBLE MULCH FARMER

By Wally Bruce

IN northeastern Colorado stubble mulch farming and Pete Loos seem synonymous. Pete has used this conservation practice since 1942. He says his interest was first aroused by a publication on the subject by Duley and Russell. The possibilities of the practice looked good. With the help of Soil Conservation Service technicians he rigged up his first subsurface tillage machine.

The machine that Loos used in 1942 is quite a contrast to what he uses today. He took an old Peacock drill, put 2 extension beams on it, and equipped it with 24-inch sweeps. "They did a good job," Pete recalls. "It was such a good job of subsurface tillage, that the neighbors couldn't figure out what I was doing, working back and forth in the field without disturb-

Note.—The author is area conservationist, Soil Conservation Service, Sterling, Colo.



Pete Loos (standing) and his son-in-law in a stubble mulch field that has been tilled once.



Stubble mulch field ready for wheat drilling on the Pete Loos farm.

ing the soil. They soon found out that I was getting results. We had a heavy rain. The land I had worked with the sweep, took it all. The land worked with a one-way had runoff.

"I had quite a little trouble the first year. The ground was uneven. My sweeps would catch stubble and drag. It was hard work. The controls on the machine were all hand operated. A day's work in the field with that machine was all that I wanted.

"The equipment today is quite an improvement. My new machine is hydraulically controlled. Today, doing stubble mulch farming is much easier. It took me quite awhile to get used to the idea of waiting to get into the field after a rain. My neighbors, using clean fallow methods, were in the field at least 2 days ahead of me. Clean fallowed land lost its surface moisture quickly. The mulch on my land kept the surface wet. I guess the lower cost of farming my way finally helped me get over those jitters. I only worked my land an average of four times. The clean fallow method required eight or nine operations. I finally decided that cutting down operating cost was compensation enough for my uneasiness over a slow start.

"While cutting farming costs is very important, I get the biggest kick out of seeing how this practice holds the soil. Since I have used stubble-mulch farming, I have had no soil blowing. My land is rolling and I did get some runoff. In addition to stubble mulch farming, I've

contour stripcropped my land. While I feel that stubble mulch farming is one of our most important conservation practices in the Plains, no one practice will do the entire job. It takes a combination of practices depending upon the needs of the land."

Loos has done a good job of soil conservation in other ways too. This is evidenced by the fact that his farm was judged the best soil conservation job, of the lower South Platte watershed, in a recent soil conservation contest.

The past 2 years, moisture has been about 50 percent of normal. It was particularly low in the New Haven community. Most of the wheat in that locality burnt badly. Pete had an average yield of 19 bushels per acre. In 1956, with moisture still very low, Loos had a 22-bushel average. The crop was uniform over the entire field. Many of the surrounding wheatfields had dry spots where the wheat fired.

Since Loos has been using stubble mulch farming, his results have been extremely gratifying. In 1945, Pete had wheat that made 50 bushels per acre. In 1946, he had wheat that averaged 40 bushels per acre on all his land. In fact, in the last 12 years he has averaged 30 bushels, as compared with 18.6 bushels average yield for Logan County.

In 1951, Pete Loos won the milling and baking contest on wheat. In 1952 and 1953, he was designated as Wheat King at the Colorado Seed Show held in Denver. He has always collected a premium on the protein content of his wheat.

(Continued on Page 191)



South Platte Soil Conservation District supervisors in a wheatfield on the Loos farm that produced 50 bushels per acre.



Tennessee

Stripcropping for soil conservation and rapidly on Tennessee

By C. L. ROBERTS

CONTOUR stripcropping has been established on about 10,000 acres in Tennessee soil conservation districts during the past 2 years. The curving, alternating strips have added beauty to the rural landscape and dollars to the farmers' pocketbooks.

The best place to see the long, even-width strips hugging the sloping fields is from the air. But the best place to learn how farmers are using stripcropping, and to find out what they think about it, is by talking to the farmers themselves.

O. K. Armentrout, cooperator with the Washington County Soil Conservation District says: "You won't have any erosion when you strip-crop. Also, planting my corn on the contour in a strip rotation increased yields by a third. And, it was easier on my machinery and took less gas."

Another farmer impressed by the amount of gas he saved by contour stripcropping is Bill Haddox, cooperator with the Blount County Soil Conservation District. Haddox works 225 acres of his dairy farm in a system of contour strips. He recently stated: "I use 20 gallons of fuel in 2 days of tractor work on a strip-cropped field that always took 30 gallons by the old method of cropping in a solid block. And, there's no washing after heavy rains."

John Wallace of the Johnson County Soil Conservation District could have told Tennessee farmers years ago about stripcropping. He's

been at it since 1937. Now 80 years old, Wallace said: "If I were a young man just starting to farm, the first thing I'd do would be to lay out a strip system on the sloping land I intended to crop. It's the best way I know to keep the soil on a sloping field." Even though Wallace grows crops on land pretty steep for cultivation, he's making 3,000 pounds of tobacco, 80 to 90 bushels of corn, and 4 to 5 tons of grass-alfalfa hay to the acre.

In the Putnam County Soil Conservation District, Zeb and Clay Warren, who started stripcropping "after a fashion" about 10 years ago, decided 2 years ago to "shoot the works" with the modernized, uniform-width strip system. They said: "We liked strip farming well enough to tear out fences and combine 6 fields into 2 units of strip-rotation, totaling 100 acres. Stripcropping makes better crops and the hand-



Note.—The author is state soil conservationist, Soil Conservation Service, Nashville, Tenn.

ee Strips

and, increased crop yields is spreading
Tennessee farms.

ROARK

ling of machinery easier. We can plow more in a day because our rows are $1\frac{1}{2}$ miles long. We wouldn't go back to the old way of farming."

William Hawks, in the Wilson County Soil Conservation District, is using strip rotations on 100 acres of his 565-acre dairy farm. In telling about it recently, he said he figured it's a good practice anyway you look at it. "Most every farmer in the county ought to be strip-cropping the sloping cultivated land," is the way he puts it.

In the Maury County Soil Conservation District, Allison Thompson was recently named conservation farmer of the year by the district supervisors. Thompson grows alfalfa and small grain in alternating contour strips on 45 acres of rolling land. Thompson says he's already making 10 to 15 bushels more oats and barley to the acre.



Milford Warman in the Henry County Soil Conservation District had been having a lot of trouble handling his "pan" land with terraces because of wet spots. The Soil Conservation Service technician there helped Warman replace terraces with a system of contour strips. Warman stated simply, "It sure is all right. Had the best crop on that field I ever had. Didn't have those wet spots either."

A lot of other farmers over the State also are learning that farming their sloping cropland in a contour strip system not only protects the land but also results in bigger harvest. One is H. B. Whitnel of the Obion County Soil Conservation District. District supervisors met on his farm recently. Impressed at what they saw, they broadcast the story over radio station WENK. L. H. Crowell of the Marion County Soil Conservation District is another farmer who "likes strip-cropping fine because the land doesn't wash anymore and it's easier to work."

These are the opinions and comments of just a few farmers. Everyone with strip-cropping has a good word to say for it.

Yields have increased—Less soil is lost—More moisture conserved—Should have been doing it for the past 20 years—Highly pleased with results, are some of the comments.

In view of the esteem in which strip-cropping is held and the good results it is producing for those using the practice, it is believed that strip-cropping on Tennessee farms will be substantially increased during the coming year.

A Dream Come True

A biology professor, with cooperation from State and Federal Agencies, helps create a conservation training center for school teachers of North Dakota.

By DAVID O. DAVIS

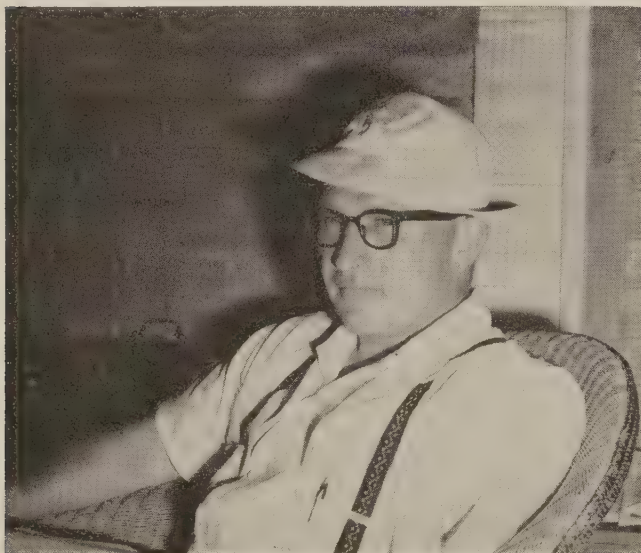
A campfire and a dream. That was the beginning 7 years ago. Now it is North Dakota's State Conservation Training Center, located in Ritchie Memorial Nature Camp, on the shore of Lake Ashtabula near Valley City.

The Center has seven buildings—bunkhouses and baths, a kitchen and messhall, a recreation building, and a classroom and laboratory. There are driveways and parking places for automobiles. There is a landing for several boats, and a diving- and fishing-raft.

There were six students at first. Their leader and teacher was Dr. Marvin A. Leraas, professor of biology at Valley City State Teachers' College.

Leraas was concerned that so many people were going into the teaching profession unprepared to teach conservation. So in 1949 he offered a field biology course during the college summer session. The course was to be studied from the standpoint of conservation.

Note:—The author is field information specialist, Soil Conservation Service, Denver, Colo.



Professor Marvin A. Leraas.

They camped near the Lake Ashtabula Dam. Tents were their shelter. The campfire cooked their food and provided light for their discussions after sunset. Their laboratory was the great outdoors.

The enthusiasm of this small group of students persuaded Leraas to offer the next summer a course in conservation education designed to prepare teachers to teach the material required in the state elementary course of study. Eight teachers attended in 1950 and 1951. These courses, too, were held outdoors.

The success of the courses convinced Leraas and the college authorities that they needed more than just a temporary camp. On April 17, 1952, the college obtained a 20-year lease from the U. S. Army Corps of Engineers of a tract near Lake Ashtabula.

That same year members of the National Wildlife Federation, and state and county chapters, contributed to a fund of \$3,000 for initial improvement of the campsite. The camp was dedicated to the late Dave Ritchie of Valley City. General Ritchie, a former president of the North Dakota Wildlife Federation, was an ardent proponent of conservation education.

At the dedication, Leraas said: "It has been my feeling for a long time that North Dakota has been negligent in providing facilities for training teachers to have a greater appreciation of the urgent need for conservation education in the public schools. The Ritchie Memorial Nature Camp has been set aside, and will serve, in part at least, to attain this educational objective."

The camp is in Barnes County. The Barnes County Commissioners lent dirt-moving equipment to construct an approach to the camp and to level an area for the first building that then became a combination classroom-kitchen-messhall. Then two small shacks were moved to the

camp site and refurbished. These buildings were just barely large enough to hold four double-deck bunks and leave room to stand up-right between the bunks. But they provided sleeping quarters for a number of teachers during the years to follow.

Two sessions were held in 1952. Twenty-five teachers attended the first session and thirty-three the second. The main classroom was crowded. Of course, most classes were still held outdoors. But people had to come inside when it rained. So a large tent was set up for a classroom during the 1953 sessions. And a 20-bed bunkhouse was built.

Three sessions were held in 1953 with 82 teachers attending. Meantime the camp had attracted attention throughout the State. The North Dakota Association of Soil Conservation Districts recommended that districts of the State provide scholarships to teachers who wanted to take a course at the camp. Through 1956 North Dakota districts have provided 150 such scholarships.

Some districts furnish scholarships to as many teachers within their county as wish to attend. The majority, however, offer four per year. Other agencies also provided scholarships.

The students to date have been mostly rural teachers. Someday it is hoped to have the same response from urban areas.

Leraas was no longer carrying the whole instruction load. Representatives of the North Dakota State Game and Fish Department, the North Dakota Geological Survey, the Bureau of Reclamation, Bureau of Fisheries, Extension Service, and Soil Conservation Service were helping. Yet Leraas still did most of the instruction.

There were three sessions in 1954. Eighty-eight teachers attended. Then, on January 7, 1955, a memorandum of understanding was signed between a group of local, State, and Federal agencies concerned with the project.

Under this memorandum the Barnes County Soil Conservation District assumed the 20-year lease and agreed to pay the rent. The State Association of Soil Conservation Districts and the State Soil Conservation Committee agreed to provide funds to give the camp an adequate water and sewage system, additional bunkhouses, a mess hall, a classroom and laboratory, and ground improvements with demonstration plots of trees, grass, and contouring. The State Board of Higher Education agreed that the



Aerial view of Ritchie Memorial Nature Camp on the shore of Lake Ashtabula, N. Dak.

colleges and universities of North Dakota would join with other agencies in creating an academic and policy committee to formulate courses, make recommendations for accrediting courses, and make plans for enrolling more students and providing additional instructors.

A short time later the supervisors of the Barnes County district received contributions from the other North Dakota districts—and active work on the center improvement got underway. A 24- by 60-foot laboratory and classroom, with showers and sewage facilities, was erected. Some ground was landscaped. This was done in time for use by 121 teachers during the three 1955 sessions. The work continued throughout the year until the present seven buildings and ground improvements were ready for the 1956 sessions.

The academic and policy committee met twice in the fall of 1955. Leraas was appointed chairman. The outcome of these meetings was the much enlarged program for the center in 1956.

There were 5 sessions in 1956; 240 teachers attended. A total of 589 teachers, from 1949 through 1956, have attended the center to learn how to teach conservation. Sessions are 1-week long. Three hours college credit are earned per session. A person can stay up to 3 weeks and accumulate additional credits and more conservation knowledge. Sessions are scheduled so there is no conflict with regular college summer sessions.

That first campfire died many years ago. Not so the dream. As Leraas says: "This is a good

thing we have here. But it can be better still. Conservation is important. Yet a teacher, to improve a career, must study other things too. I want to see the day come when a teacher can camp at the center, earn career credits, learn to teach conservation—and not have to move from the center to do it."

Group Action

Montana gets conservation results by stimulating interest in conservation from all walks of life.

By H. W. RIEK

BACK in 1948 when a small group of conservation minded citizens met to organize the Montana Conservation Council, none of them would have predicted the growth and enthusiasm of membership that the council enjoys today.

Actually, the true beginning of this organization dates back to 1941, when the Montana chapter of the Northwest Conservation League was first established. At that time the chief interest of the group was the conservation and preservation of timber and wildlife resources. This small group of people gradually came to realize that the program should be expanded to include all of the State's natural resources.

Now, after 8 years of existence, the Montana Conservation Council boasts a unique organization, with a membership of 1,300 people from all walks of life. Professional men and women such as doctors, lawyers, teachers, college professors, bankers, are well represented as well as a liberal sprinkling of businessmen, farmers, ranchers, miners, technicians, professional conservationists, and students.

All programs and activities of the council are based on the principle that conservation is everybody's business. In furthering that idea, dues for full membership in the council have been kept at \$1 per year. There are contributing memberships for businesses and organiza-

Note.—The author is area conservationist. Soil Conservation Service, Billings, Mont.



Demonstration being conducted in outdoor laboratory at Camp Ritchie.

tions that go from \$5 up, and this is one of the chief sources of income for the group.

There are three principal activities that are carried on annually by the council. These are the conservation caravan, a special statewide conservation week, and the regular annual meeting of the council.

The conservation caravan is a council sponsored activity started in 1949. Arrangements are made with a bus company to transport the caravaners for a whole week. During this time, conservation problems and accomplishments are studied. Each night the caravan is in a different town and more often than not they will be the guests of some industrial concern or civic group. During the day stops are made at points of interest.

The 1956 caravan started at Helena and took in an area through central Montana that included visits to Holter Dam; the smelting plant and wire mill of the Anaconda Copper Mining Company; a visit to a timber cutting area in the national forest; a visit to the Central Montana Experiment Station; coal mines at Roundup, and an oil refinery at Billings. From Billings the group drove over the scenic Cooke City highway through a portion of Yellowstone Park. On the way back to Helena they visited a museum, a Federal fish hatchery, and a modern sawmill.

Even though the primary objective is educa-



Conservation caravan group studying soil samples.



Pulpwood harvest being observed by conservation caravan group.

tion, these trips are exciting and entertaining. Several soil conservation districts offer trips on the caravan as incentives to teachers or as prizes for conservation contests.

Montana Conservation Week is another activity sponsored annually by the council. This starts with a proclamation by the Governor. Federal and State agencies, schools and colleges, newspapers, radio stations, and civic clubs participate. The central theme is to bring to everyone's attention the importance of conservation. Special editions of newspapers, radio and TV programs, contests, special programs by garden clubs and civic organizations all help to focus attention on the significance of the week.

The annual meeting of the council is usually held during the last 2 days of Conservation Week and provides a fitting climax to a group of conservation activities that emphasize the importance of conservation to everybody. At this time the annual business meeting of the council is held.

The Montana Conservation Council is incorporated under the laws of Montana. The main business of the council is carried on by a board of 12 directors elected for terms of 3 years each so that the terms of 4 directors expire each year. All officers with the exception of the secretary-treasurer are elected from this board of directors.

Annual meetings are carried out on a town hall principle, to provide a public forum for the study and discussion of specific Montana needs and problems. Usually two items of current interest in the conservation field are selected. Then these subjects are discussed by selected panel members, after which the discussion is thrown open for comments from the floor.

Subjects selected for the 1956 meetings were "Reclassification of Land for Taxation Purposes" and "Montana Groundwater Resources." Attendance at the meeting was 291. This included visitors from two neighboring States who came to find out just what made the Montana Conservation Council click, and to see if something along the same order might be adapted to their States.

Other accomplishments of the council in recent years include: (1) Stimulating conservation education in public schools through teacher workshops and assistance on state legislation; (2) publishing a conservation handbook for teachers; (3) assisting in the establishment of a pilot project for teaching conservation in the public schools of Anaconda; (4) providing speakers for special programs during Conservation Week.

PROGRESSIVE TRUCK FARMER

Amos H. Funk became interested in soil and water conservation while attending annual meetings of the Lancaster County (Pa.) Soil Conservation District in 1939. He was living and working with his father on an 83-acre rolling limestone farm at the west edge of the village of Millersville. A few gullies were interfering with farming operations and in some places the topsoil was very thin. A Soil Conservation Service employee called one day and started Funk on his conservation work. They visited the Earl Groff farm near Strasburg to see the first broad based terraces constructed in Lancaster County.

They went over the home farm and decided what conservation measures were needed. With the permission of his father Amos began developing a soil and water conservation plan in 1939. In 1950 Amos took over the operation of the farm. That year he was elected to the board of supervisors of the soil conservation district. In 1951 he was named chairman of the board and has held this position since.

His farm had been in the family since 1868 when Funk's grandfather purchased it and started a general farming program. He had a large number of hogs to which he fed the garbage from the nearby State normal school. He had cows and sold the milk on a route through the village. Some small fruits and asparagus were sold to the milk customers.

When the father of Amos took over the farm he continued the general farming program. His wife was interested in the extra money she could get selling vegetables on the Lancaster markets. From this start stemmed the trucking enterprise Amos operates today.

Of the 60 acres of tillable land, 40 are devoted each



Amos H. Funk.

year to the production of vegetables for the markets of Lancaster. Funk goes to these markets 3 days a week. At times, on Saturday, he attends 3 markets the same day. He also sells cabbage, spinach, and lettuce to the wholesale market.

Amos grows a wide variety of vegetables and small fruits, including 16 acres of sweet corn, 6 acres of celery, 3 acres each of raspberries and sweet potatoes, and smaller acreages of lima beans, radishes, asparagus, tomatoes, cauliflower, broccoli, strawberries, red beets, and peas. He also grows some pansy plants.

This program necessitates intensive cultivation. Sometimes three crops are grown on the same land in one season. To combat this heavy cropping, Funk rests 20 acres every year seeding them to alfalfa and ladino clover that is mowed and left on the land.

To help protect the soil 9,400 feet of broad-based terraces have been constructed, 700 feet of diversions, and 1,200 feet of waterways. To increase production, Funk installed an irrigation system in 1953. The source of water, a neighbor's farm pond, proved inadequate. In 1954 he went to the nearby Conestoga River for his water supply.

This new layout has a pump with 1,000 gallons per minute capacity. Twenty six hundred feet of 8- and 6-inch aluminum pipe serve as the main, while 2,000 feet of 5-inch laterals are used to irrigate the crops.

Amos reports that he likes his conservation farming. No more does he turn around in a field because of gullies. His badly washed soil is slowly coming back into good production. He says that his conservation work has added to the value of the farm.

—W. MARTIN MUTH

Bermudagrass Waterways

Farmers in the Texas "Blacklands" are using bermudagrass, once considered a pernicious weed, more and more as an erosion control plant in their waterways.

By VIRGIL S. BECK

A villain has been reformed, at least from the viewpoint of many farmers of the Blackland Prairie of Texas. Hardly a decade ago, these farmers fought bermudagrass with a vengeance. They considered it a scourge and menace to their cultivated crops. Today, many of these same farmers look upon bermudagrass as one of their greatest allies in fighting soil erosion.

The Blacklands extend from a few miles south of Red River down to San Antonio. The strip is about 400 miles long, and varies in width from about 80 miles in the north to around 20 miles at the southern tip.

Slopes are gentle, about 3 percent or less, on croplands. The soil is deep, fine textured, heavy black clay. The annual rainfall is around 36 to 40 inches, and the soil is highly susceptible

Note.—The author is field information specialist, Soil Conservation Service, Denver, Colo.

to erosion. One of the main problems is to get excess water off the croplands without serious erosion.

And that's why the once detested bermudagrass has come into good favor with Blackland farmers during the last 10 years. The villain has become a sort of hero to a lot of people. The rapid spreading bermudagrass has been one of the best grasses for sodding waterways.

"Grassed waterways are the foundation of the conservation program in the Blacklands," declare Soil Conservation Service technicians. "At least 90 percent of croplands of the area need terraces, and practically all terraced land needs waterways."

Waterways vary from 50 to as much as 250 feet in width, and may be as much as 5,000 to 6,000 feet in length. In establishing grass waterways, farmers usually try to use the natural drains on their land. However, in some instances it is necessary to shape a waterway by



Bermudagrass waterway that disposes of water from 45 acres of terraced land in Collin County, Tex.



Bermudagrass waterway that was established in growing cornfield in Collin County, Tex.

plowing to guide the flow of the water.

Bermudagrass is highly favored for sodding waterways in the Blacklands, although some King Ranch bluestem, and coastal bermudagrass are being used. Bermudagrass roots or sprigs are obtained from sandy areas so the dirt can be shaken off easily. These are trucked in at a cost of about 12 cents a cubic foot. Most planting is done by hand. The roots or sprigs are dropped into a furrow and are covered by plowing. Bermuda has been used on approximately 75 percent of the waterways in this area.

King Ranch bluestem is used only on slight slopes, and is seeded instead of being sodded. The waterways usually are made wider to permit the water to flow at shallow depths and low velocity because the grass is not as dense as bermuda, so not as erosion resistant. Flowing water tends to cut around the clumps of bluestem, so careful maintenance is necessary to prevent the washing out of potholes. However, this grass is recommended where competition and maintenance are major problems.

Coastal bermuda is being used on some waterways, particularly around Farmersville, and creates a heavy, dense mat that is highly effective in checking erosion. Roots have to be shipped from Georgia, however, so are rather expensive.

There are a few native tall grass waterways in the Blacklands, and buffalograss has been used occasionally.

Farmers are high in their praise of grassed waterways. "If your land needs terraces, waterways or protected outlets are a must," they declare.

"I recognized the problem of disposing of excess water from my fields several years ago, but didn't know what to do about it," says Herman Robinson, who operates 5 small farms near McKinney, owning 3 and renting 2. He has waterways on 4 of these farms and plans to put 1 on the other.

Robinson bought a 100-acre farm 8 miles northwest of McKinney in 1950. The land was being damaged by sheet erosion. He decided to establish a grassed waterway so the needed terraces could be constructed. There was no depression in the field that might be developed into a waterway, so he constructed one along the fence line. He established the waterway 2 years before he started building his terraces. The land now is terraced and erosion has been checked.

"I used King Ranch bluestem on my waterway, but now I like bermudagrass better," reports Robinson. "I remember that back about 10 years ago, we all hated bermuda, and worked hard to keep it out of our fields. Now I know that you can plow out and kill bermuda any time you want to, so it's no problem."

Most Blackland farmers have some livestock, but many had to sell this year because of the drought. About 40 percent of the land in Collin



KR Bluestem waterway near Wylie, Tex.



Bermudagrass waterway that is used as a hay meadow, near Rhea Mills, Tex.

County where Robinson farms is in pasture. Cotton is the main crop, with some grain sorghums, wheat, and oats being grown.

G. H. Porter, who farms about 8 miles northwest of McKinney, says: "Waterways provide insurance against erosion for the rest of the farm, some grazing, and a little hay." He has 191 acres, of which a 3,000-foot waterway takes 5 acres.

Before Porter established his waterway, drainage from heavy rains crossed in front of his house to a roadside ditch. This created a flood hazard for his buildings. The waterway now empties into a creek at a considerable distance to the rear of his house.

R. F. Newsome, who is administrator for the Rhea estate in the same vicinity, has 12 waterways on 510 acres. He has approximately 20 acres in waterways that provide protected outlets for some 20 miles of terraces on 450 acres of cropland. He uses the waterways for pasture and cuts some hay.

SCS Area Conservationist George Wood reports that during the 1955-56 waterway construction season, 871 waterways were marked out in the 6 soil conservation districts he serves. The land was prepared for 690 waterways, 581 were sodded or seeded, and 446 actually were established and are functioning. Drought prevented successful completion of the others.

Conservationist Wood reports that 15,878 more grassed waterways are needed in the 6 districts.

With the large number of waterways established during recent years, utilization of the grass growth presents a problem for most farmers, points out J. M. (Bud) Norton, SCS work unit conservationist at McKinney.

"Since most fields are not fenced, grass on the waterways cannot be grazed unless electric fences are set up to keep livestock out of the fields," Norton says, "If the grass isn't grazed, then it can be mowed, baled and used, or sold. But the greatest value of the waterways is to prevent erosion of valuable cropland rather than for production."

Until recent years, some farmers allowed their waterways to empty into roadside ditches. This often resulted in serious damage to roads and highways with gullies sometimes cutting back into fields for 500 feet or more. Where it



Gully formed from a V-ditch used as a terrace outlet near Wylie, Tex.

is necessary to drop water to lower levels, stabilizing measures are required to prevent overfalls, or head cutting, SCS technicians point out.

Drop inlets are being used to solve this problem, particularly around Farmersville. An earthen dam is constructed across the waterway at the edge of the roadside ditch and an L-shaped drop inlet of corrugated pipe installed. The upright part of the structure is in front of the dam, and connects to the horizontal pipe that leads through the dam and to the roadside ditch.

Drop inlets may vary from 24 to 72 inches in diameter, depending upon the size of the drainage area. They may cost from \$500 to \$1,500, depending upon the size needed to handle the water. For example, a 54-inch pipe to handle drainage from 70 acres near Farmersville cost about \$1,500. Concrete pipe is cheaper, but the weight causes the joints to settle and break the pipe, so it soon becomes useless. About 20 drop inlets have been installed around Farmersville.

INVENTORY IN NOVEMBER

A New Mexico sheep rancher takes an inventory of both livestock and forage each fall and plans the next year's operations accordingly.

By CLEMENS F. WEINDORF

TAKING inventory in November may seem strange to folks in the business world who are accustomed to count their assets and liabilities at the end of the calendar or fiscal year. But for the rancher, the end of the growing season is the time for him to go to market with his product. He has a fine crop of calves or lambs. At the same time he takes inventory of the forage he has available for the next year to produce another crop of beef, mutton, or wool.

Taking inventory of the available forage on his ranch has been considerably easier for John

Cauhape, of Pinon, N. Mex., since he adopted a circular or rotational system of deferred grazing. Some folks call his grazing principles circular grazing, others call it rotational deferred grazing. Under either title it has meant more grass for more lambs and more cash for less work than the older and less controlled method of grazing found on many ranches.

The ranch that Cauhape owns and manages covers approximately 105 sections at the base of the Guadalupe Mountains near Pinon, N. Mex. Due to the odd shape of the ranch, being 25 miles long, with the widest point only 6 miles, many problems in proper management were encountered.

Upon becoming a cooperator with the Penasco Soil Conservation District in 1954, Johnnie, as most of his friends call him, became acquainted with some of the ecological features of the vegetation on his ranch. He found out that all of the vegetation in his pastures was not of the most palatable and highest yielding species that he could grow. He became familiar with the terms vigor and density as applied to range cover. He began to realize that through years of continuous heavy grazing together with extreme droughty conditions that many of the better or more palatable and high forage yielding grasses were very weak, and in many cases dead, exposing the surface to severe wind and water erosion in many areas.

Careful observation by Cauhape, along with the Soil Conservation Service conservationist, showed that the sheep were grazing only the better, native grasses and leaving the less desirable species untouched, giving them a chance to grow in vigor and reseed. "I guess sheep are



A typical pasture scene on the John Cauhape ranch.

Note.—The author is work unit conservationist, Soil Conservation Service, Capitan, N. Mex.

just like my little boy and girl," Johnnie stated, "My boy and girl would rather eat ice cream any day than the vegetables we place in front of them. I guess that is the way with these sheep on the better and poorer grasses."

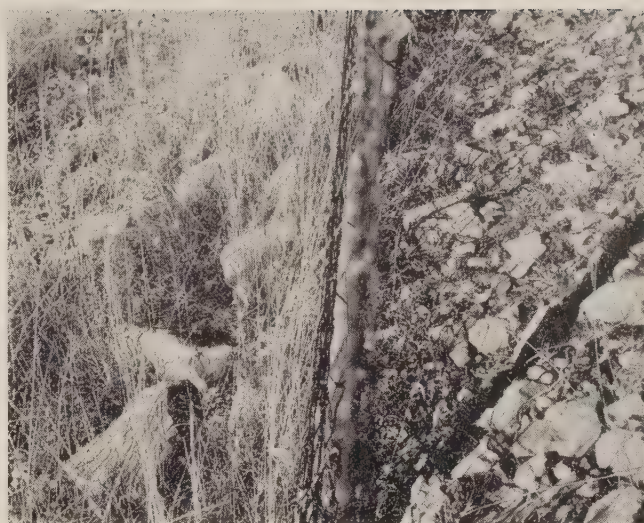
From these observations, Cauhape realized that a systematic grazing program had to be initiated to give the desired forage a chance to build up in vigor and reseed the bare areas.

Only 33 years old, Cauhape was born into a family of sheep raisers. His father, John Pete Cauhape, founded the headquarters of the present ranch in 1911. Today, Johnnie is trying to see that the family name will remain closely linked with the wool and lamb production industry in New Mexico for many years to come. He decided to defer grazing on two thirds of his ranch at a time and graze only one third, changing thirds every 6 months. Through this system, on the pastures that are not grazed during the growing season, the grasses are given a chance to build up in vigor and reseed, without interruption from frequent clippings.

The area being grazed is stocked somewhat heavier by bunching the livestock on one third of the ranch. By stocking these areas heavier for a short period, the sheep are forced to graze the undesirable grasses such as three-awn, ringgrass, and burrograss as well as the more palatable species. This has a twofold reaction. First, all of the forage being grown is utilized and turned into more pounds of wool, mutton, or beef. Secondly, the undesirable species are put into direct competition with the better grasses by being grazed frequently. The rate of stocking is regulated to prevent grazing the grasses to the extent that they are killed out completely. The result is that the unpalatable grasses and weeds are lowered somewhat in vigor and are not given a chance to reseed as profusely as they would be able to do when the pastures are grazed by smaller numbers on a yearlong basis.

The sheep are moved into a new third at the time of shipping and shearing, usually in March and October. In this way each third of the ranch is given 2 years (growing seasons) of rest before it is grazed again while growing.

"I've never dreamed that grass could come back in a year or two, once it was down and nearly killed out," Cauhape said. "But I've



Fence line on the Cauhape ranch separates a grazed pasture from one on which grazing was deferred.

seen it done on my own ranch even during these dry years. If you let that grass have a chance to grow, it will take care of itself and you."

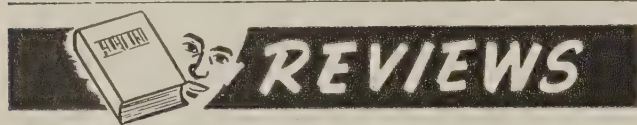
The deferred rotational grazing management program is sufficiently flexible to increase or lower the number of livestock on the ranch according to the moisture received and forage produced. During seasons of drought and low forage production Cauhape is not at the mercy of the market to ship off at once. He can do this over a period of 6 months or more, due to the forage he has in reserve on the ungrazed portions of his ranch.

"The way a rancher uses his grass, is the way he expects things to be in the future." John stated, "I've got a program that will show me just where my herd stands in relation to the amount of grass available, and that's the way it will stay."

STUBBLE MULCH FARMER

(Continued from page 179)

Pete Loos is chairman of the South Platte Soil Conservation District board of supervisors, and he practices what he preaches. He has contour stripcropping, grass waterways, grass seeding, wildlife plantings, shelterbelts, diversion dams, water spreading, and terraces on his land.



IRRIGATION ENGINEERING, Vol. II. By Ivan E. Houk. 531 pp. Illustrated. 1956. New York: John Wiley & Sons, Inc. \$14.

THIS book is the second of two volumes on irrigation engineering. It is devoted primarily to the planning of large gravity irrigation projects and the factors that must be considered in the design of the structures that are required to make such projects operate properly.

The first 4 chapters are concerned primarily with the planning phase of the large irrigation project, and the remaining 12 chapters discuss in detail the various structures that may be required to insure proper functioning.

The author has drawn rather heavily on the experience of the Bureau of Reclamation, and many of the structures cited and illustrated are now operating successfully on existing Bureau projects.

Numerous illustrations are included that have been selected from a wide range of conditions and show the application of the principles of design covered in the text.

The author has skillfully discussed the numerous factors that must be considered in the design and installation of various types of irrigation structures, including new criteria that has been developed in recent years, without getting unduly involved in the basic details of design that are covered in other books. A comprehensive and useful list of references is included at the end of each chapter for those who desire to study additional material on the subject.

—T. H. QUACKENBUSH

CALIFORNIA AND THE SOUTHWEST. Clifford M. Zierer, editor. 376 pp. Illustrated. 1956. New York: John Wiley and Son, Inc., \$11.25.

THIS is truly a great source book on facts about California, New Mexico, Nevada, Utah, and Arizona. There are 34 chapters written by 32 southwestern authorities.

Millions of people have been crowding into the Pacific Southwest during the past generation, and this extraordinary trend continues unabated. The desirability of large concentrations of people in any area should be evaluated in terms of natural resources and economic opportunities to support growing populations.

The editor says that this book was written in hope that it might contribute to a better understanding of the people, resources, industries, problems, and potentialities of the region. This goal has been reached in a generous measure for the potential settler can get from this volume a mass of interrelated facts on natural resources, culture, business, agriculture, mining, transportation, manufacturing and population patterns, and political relationships. Also, there are numerous illustrations, maps, and charts that will aid the reader to better understand the text.

B. W. ALLRED

QUACKGRASS CONTROL.—One of the newer chemical weed killers has proved itself for controlling quackgrass in potato fields, according to John Schoenemann, horticulturist at the University of Wisconsin. He says dalapon is a safe, low-cost quackgrass control in potatoes.

Land that received no dalapon and was fall plowed only, yielded 400 bushels to the acre. Land with the quack cultivated 6 times the preceding fall yielded 420 bushels. Ten pounds dalapon per acre in the fall upped the yields to 502 bushels. But land with 5 pounds dalapon in the spring yielded 660 bushels.

A black and white photograph of a desert landscape. In the foreground, a bird of prey, possibly a falcon or hawk, is perched on a light-colored, craggy rock. The bird is facing right, with its head turned slightly towards the viewer. It has dark plumage on its wings and back, and lighter, speckled plumage on its chest and face. The background consists of rolling, arid hills under a clear sky. The terrain is sparsely vegetated with small, dark shrubs. The overall tone is sepia or aged black and white.

APRIL 1957

Soil Conservation

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION.

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SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C

★ THIS MONTH ★

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CRABGRASS CONTROL.—Excellent results in crabgrass control on lawns through chemicals was recently reported by horticulturists R. B. Taylorson, R. C. Room, and M. N. Dana of the University of Wisconsin. They claim the best results from use of NPA (naphthyl phthamic acid).

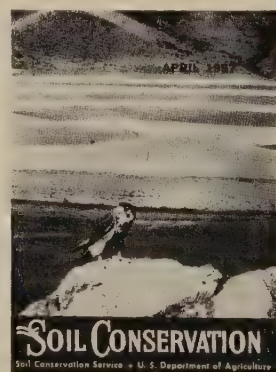
Two applications at about the time crabgrass seeds were germinating last year gave very good control with little injury to desirable grasses. Application time was late May and early June. Rates were around one-fourth pound of active chemical per 1,000 square feet of lawn.

There's a chance for crabgrass control with one application if timed properly, the scientists feel.

Another promising treatment was Standard Spray C (an oil), plus a chemical called MAA (methyl arsonic acid). However, there's some danger of injury with this treatment and further experiments are needed to prove its worth.

In these tests, a widely used material called PMA was not successful. MAA alone also gave poor crabgrass control, the researchers said.

Editors are invited to reprint material originating in this magazine.



FRONT COVER.—Wild prairie falcon surveys the terrain of the Portneuf Soil Conservation District in Idaho.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Independence at Littleton Common

A conservationist explains how saving soil means independence for the farmers of his community.

By **BERNARD A. ROTH**

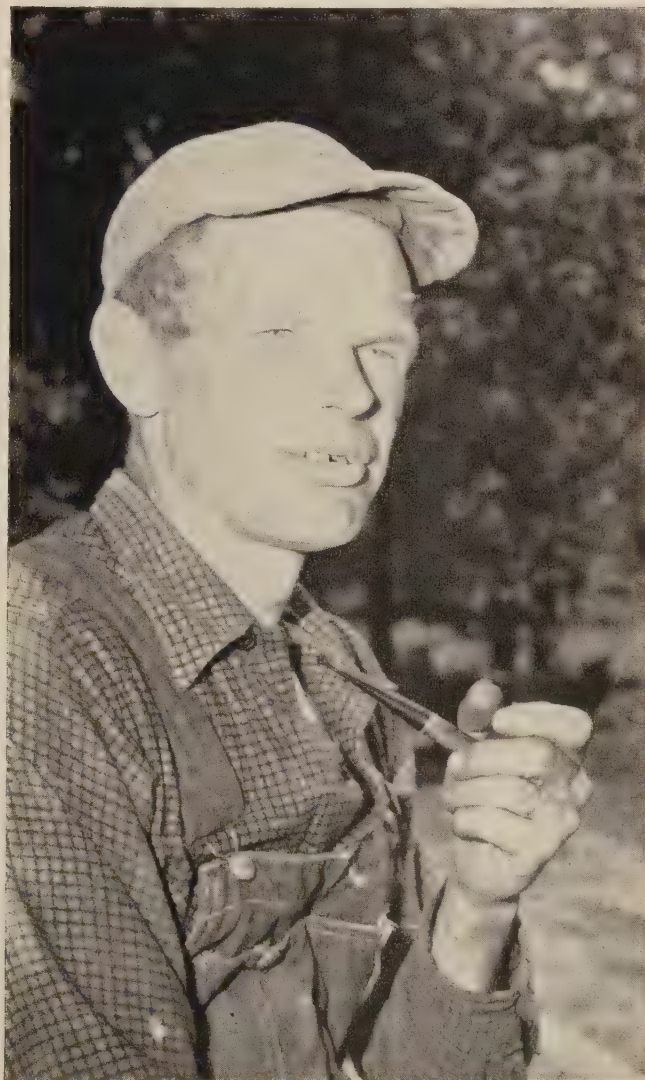
“**T**HAT used to be brush, wire grass, and moss, and now look at it!” Bob Stuart pointed to a 5-acre patch of meadow knee deep in alfalfa and brome grass. “In the old days, 500 pounds of hay was a big take for that knoll. Right now, we’re cutting better than 4 tons to the acre, sometimes 3 cuttings a season.” The New Englander made a sweeping gesture that included the rest of the meadowland across the road from his 200-year-old farmstead.

When Robert E. Stuart, of Littleton Common, Mass., talks about soil conservation farming, people stop and listen. He makes it sound as practical as an ax handle. And that’s just the way he looks at it, having had 10 years’ leadership in the Middlesex County Soil Conservation District. He’s been chairman of supervisors much of the period. Recently he started a 5-year term on the State Soil Conservation Committee.

“Here in Middlesex,” Stuart said, “we’ve taken up conservation as a lot of our ancestors did when they grabbed a musket and marched off to fight at the Old North Bridge. Practical, yes. But behind it all, I think, we’re aiming straight at independence. Let me show you what I mean.”

He did show us. It was a grand tour of 150 acres choicely used. The fields sparkled with new grasses, all installed since Bob took over in the late thirties—ladino clover and orchard-grass in the pastures, alfalfa and brome grass for hay. A bed-drainage system was at work bringing new life to one meadow. A 600-foot diversion ditch was taking the soggiess out of a pasture. “We’ve got about a mile of open drains,” commented Bob, “and nearly as much tile.”

Where a strip of corn caught the sunlight, Bob explained, “There’s our crop rotation—a year of grain and four of grass. It’s a long one. Even so, we can grow enough grain for our cattle, except for the supplement. That is, we could if we didn’t have the chickens to feed,



Robert E. Stuart.

Note.—The author is an information specialist, Soil Conservation Service, Upper Darby, Pa.

too. And, by the way, we have our own ham-mermill that serves us, and some of the neighbors, as well."

Stuart's 60-odd Holsteins munched contentedly near a stone wall along the roadside. Among them were beef animals destined for the Stuart larder—two Angus and three Hereford steers. Back of the big comfortable farmhouse, shaded by stately elms, were houses for 1,500 laying hens. "I'm on the truck every Friday," said Bob. "We *retail* 90 percent of our eggs and 75 percent of our poultry; but we wholesale all our milk."

From there, the trail led through 25 acres of clean-limbed woods fenced from the herd. "We farm the woodland, too," Bob explained when we noted the absence of "wolf" trees so common to the Northeast. We emerged into a vineyard that Bob described as his "plushest" acre. "They're Concords, Fredonias, Ontarios, Niagaras and Brightons—but the dark grapes are the best sellers. Stores take every last one we can produce. Too bad it takes so long to

develop a vineyard," he concluded wistfully.

Back in the farmyard, Bob grinned when we pointed to a sign on the gatepost advertising "rotten manure." He explained it was a "little gold mine" his younger brother had located, in the foundation of an old barn. Packed in used fertilizer bags, it readily brought \$1.25 per 50 to 75 pounds from suburban home gardeners, roundabout. "We don't believe in skimping our own soil treatment, either. We manure as heavily as we can. And, offhand, I'd say we use 50 tons of lime, 10 or 12 tons of commercial fertilizer, and about 3 tons of superphosphate a year."

Mention of his brother, reminded Bob to make it clear the farm was a joint enterprise shared by himself and James, and their families. Two other brothers had left the farm. Arthur, in the New England tradition, had gone to sea, attended Annapolis, and became a career officer in the Marines. Wallace was first secretary at the American Embassy in Uruguay.

"So you see how conservation has worked for



Beef steers and milk cows graze side-by-side on the Stuart farm.

us," went on Bob, as we sat in the cool, roomy kitchen. "It's given us a real variety of production that I think a family farm needs. If one end of the income goes down, we've always got something to balance it out. Sometimes the cows support the chickens. Another year it'll be the chickens' turn. So it goes. But I honestly believe if people would get just a little old-fashioned—diversify more—there'd be fewer ups and downs in agriculture."

Middlesex Soil Conservation District's record in the national soil conservation effort tends to support Bob's theories. It has been a steady leader in soil and water practices. Its books and affairs bear the stamp of smart business management. Farmers pay cash on the barrelhead

for district equipment, services, and materials. Contractors seek its trade and readily pay a 5 percent fee for SCD job arranging. This year, the county won the Goodyear Soil Conservation Award for the second time.

What's the biggest challenge the district faces?

Bob's answer was ready and sincere: "I think it's to show our city folks the importance of soil conservation. I think we've got a great opportunity, now, with so many of them spilling over into the country. We need to convince them that this work is also theirs—part of a national obligation." He smiled reflectively. "Don't worry. We've got plans for them."

Pines For Profit

Many McCurtain County, Okla., farmers are planting pine seedlings instead of cotton and finding the new type of woodland farming more profitable.

By EARL J. HAYES

"ONLY God can make a tree." But, when a man plants a pine seedling he becomes a junior partner in growing a tree. If good forest-management practices are followed, the junior partner should find the enterprise profitable.

Joe Hough recently marked and sold pine from five 40-acre tracts on bids. He received \$5,000 in cash and only 27 percent of the standing pine was removed.

"Say, that stuff is worth money!" Joe exclaimed, as he hurried away to plant some more. Hough has been cooperating with the Little River Soil Conservation District for 18 years, and is recognized as one of the best "tree farmers" in the district, according to Charles P. Burke, woodland conservationist, Soil Conservation Service, who is assisting the district.

None of our forefathers could have predicted that the sandy land, piney woods of south McCurtain County, Okla. would, in a relatively short time, change back from forest to farms to forest.



Thrifty young pines on the John McCloy farm in McCurtain County, Okla.

Note.—The author is work unit conservationist, Soil Conservation Service, Idabel, Okla.

The early farmers, around 1910, had good farm production as long as soil and plant food were present in adequate amounts. With declining yields and increased production costs a big percentage of these new farms became marginal within two decades. With depression prices in the early thirties, a high percentage of the farms became submarginal and tax delinquent; some were abandoned.

The area under discussion covers about 200,000 acres of forested coastal plain on which 600 farms were located in 1930. Today the same area has 300 farms. The living standard of these farmers has improved along with sound conservation concepts.

Now the big trend is pine! With Soil Conservation Service technicians working with the Little River Soil Conservation District a big change has come about. Since 1940, over 8,000 acres of land have been girdled or poisoned to release the interspersed pine for more rapid growth.

Pine planting has lately become relatively easy. The district supervisors have planting crews who operate on contract. With Agricultural Conservation Program financial cost-sharing, the expense to farmers is less.

"People owning pineland now," Dick Piner, Board Chairman, said recently, "are pulling their hats down and looking for adjoining land to buy."

By SCS land-capability survey standards this flat, undulating sandy land is most suited to timber. Row crops cause rapid soil deterioration, especially in this 47-inch rainfall belt. Soil conservation practices on cropland will maintain the soil and improve its productivity, but with less margins of profit than from pine trees.

Some people who were selling cutover pineland in 1940, on a low market, are now buying on a higher market. Yet, they have good reasons for expecting the investment to be sound.

Production records of pine on random selected 40-acre tracts from 1941 to 1957, show an average stumpage income of \$14 per acre per year. Cotton on this land class never made people that happy. The county seat of Idabel had six cotton gins in 1935, today it has one.

The future of wood production and wood products looks solid in this area. The Little River SCD has led the turnabout from idle or cutover lands to sustained production of wood crops.

Over 80,000 acres of woodland, largely pine, is under agreement with the SCD. Technical woodland assistance is furnished to help owners who wish to do those things they are not trained to do. The technician does not do the job—he helps the landowner start it in an effective way.

(Continued on page 216)



Post yard at Idabel, Okla., where the first thinnings of local pine woodlands are cured and treated for market.

Sericea Lespedeza — Present and Future

No. 21

This is the twenty-first of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By PAUL R. HENSON

SERICEA lespedeza is probably the most important perennial legume for soil conservation and soil improvement in the South. In recent months the need for soil-improving plants in the Soil Bank Program has again focused attention on sericea in the southeastern states. Few if any soil-improving plants are available which, when established, can be maintained so cheaply over a period of years. There is less agreement on the value of sericea for pasture and hay. Experimental tests and farmers' experiences have demonstrated that on unfertilized, eroded, and infertile hillsides, sericea is lacking in palatability. It is reasonably palatable when managed properly and grown on better land or when fertilized.

In utilizing sericea for forage, it is recommended that grazing begin when the plant is 3- to 4-inches high. Manage the pasture either through numbers of animals or by mowing so that young tender shoots will be available for the grazing animals at all times. For hay, sericea is cut when it reaches a height of 10-14 inches, however, total yields of hay cut at the 10- to 14-inch height are less than yields at more mature stages. When sericea pastures are understocked and not mowed, the plants become tall and unpalatable, and in such pastures spot grazing frequently occurs late in the season.

Continuous close grazing or early mowing affect the productivity and longevity of stands of sericea. Since this species is an erect-growing plant, close continuous grazing or frequent mowing will tend to defoliate the plants, so that new growth is made, in part, at the expense of root reserves. The situation may be similar to that of alfalfa, except that alfalfa in the Southeast has the opportunity to recuperate during the late fall and early winter months—a period when sericea lespedeza is usually dormant. Information on the immediate effect of time of cutting sericea on root reserves is not available; however, limited tests have been conducted on the effect of various animal cutting treatments on yields and subsequent root growth and composition.

In 1936-37, unpublished data of work conducted under the supervision of the late A. J. Pieters, H. L. Hyland, and M. A. Hein in northern Virginia and Maryland, throw some light on the effect of different cutting treatments on subsequent root growth and composition. The cutting treatments were conducted on well-established stands of sericea in 1936. In the spring of 1937, before new growth had started, the sericea roots were dug from measured areas in the plots, and were weighed, dried, and analyzed to determine the effect of the different cutting treatments on root production and chemical composition. Analyses were made by H. L. Wilkins, research chemist.

In this study, frequent clipping from late May to late August greatly reduced root weights, the protein content of the roots, and the root reserves. This was the most severe cutting treatment tested.

Root production and the percent of protein and carbohydrates remaining in the roots were also greatly reduced in plots cut for hay in September, whether or not this cutting was the first, second, or third of the year. Total root weights and the composition of the roots in the spring, after plots had either been cut once or

Note.—The author is research agronomist, field crops research branch, Agricultural Research Service, Beltsville, Md.

twice for early hay, or cut only for seed, were not greatly different. There is some evidence to indicate that generally more vigorous roots resulted in plots where one early hay cutting was made.

At Statesville, N. C., in a study of time of cutting, R. E. Stitt found that stands of sericea, when cut at 2-week intervals up to September 22, were completely killed in one year.

Reports of the effect of close grazing of sericea under experimental trials are lacking. At Beltsville, Md., in one grazing trial, steers grazed sericea lightly during the early part of the season but spot grazed areas in late summer. In these small areas the sericea was grazed to the ground by late fall. The areas were marked and recovery growth noted the following spring. Stands in the spot-grazed areas were reduced more than 80 percent and remaining plants were weak. It is possible that heavier fertilization would have reduced the severity of the damage from too frequent clipping and from overgrazing.

The results indicate that the constant utilization of sericea in early-growth stages, either for grazing or for hay, may not only shorten the

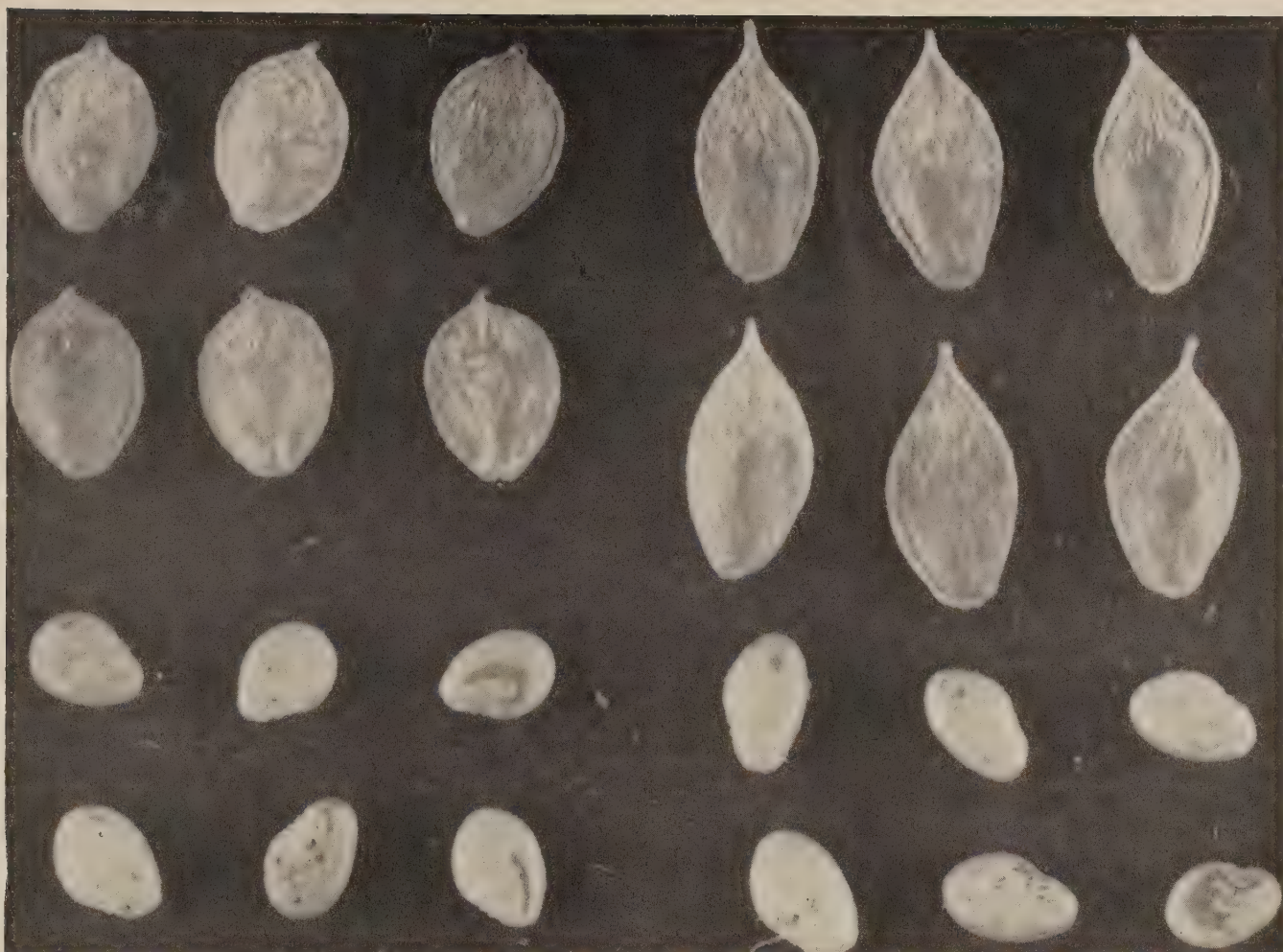
life of sericea stands but result in lower forage yields. Reports of loss of stand of sericea have become more frequent in recent years. It is also evident that the present method of sericea management has arisen because sericea becomes less palatable in later growth stages. It is self-evident that the development of more palatable, productive varieties of sericea would increase pasture gains and ease grazing-management problems or permit greater hay yields through later cuttings.

What, then, are the possibilities of developing palatable, productive varieties of sericea *lespedeza*?

Research workers, over a period of years, have established certain facts with respect to the palatability and breeding behavior of the species. The high tannin content of the leaves and the coarseness of the stems are largely responsible for the low palatability. Heritable differences in tannin content and in coarseness of stems have been noted in the present breeding programs. The seed of sericea is produced from two types of flowers: the showy or normal flowers producing open-pollinated seed, which may be largely cross-pollinated; and the inconspicuous



Sericea pasture that was closely grazed the previous year. Light-colored areas were grazed so closely that most plants were killed.



Unhulled and hulled seed of sericea lespedeza: seed from cleistogamous flowers on left and from showy flowers on right (enlarged).

or cleistogamous flowers which are self-pollinated. Unhulled seed from the two flower types are easily distinguished, making it possible to maintain inbred lines of sericea simply by sorting out and planting only self-pollinated seed. From this information it would appear to be a simple job to develop superior sericea varieties.

Unfortunately, new evidence is accumulating to indicate that the lower tannin lines are reduced in vigor and productivity. Also, continued inbreeding reduces vigor in the species. While the plant breeders are hopeful that exceptions to these situations will be found, the final solution to the problem may rest in the development of new varieties through recombinations of desirable types in some form of strain building in which natural crossing will play an important part. If the latter procedure becomes necessary, then it will become important to produce seed of the new variety in areas where a high percentage of the seed is from showy,

open-pollinated flowers in order to secure maximum cross-pollination. It is not now known where or under what conditions high percentages of seed from showy, open-pollinated flowers are produced. It is expected that the percentage of seed produced from open-pollinated flowers will vary, not only with seasonal conditions and the number of hay cuts taken, but also between northern and southern locations in the seed production area.

The problem is not insurmountable, but it is one requiring a coordinated approach by the plant breeders, the plant chemists, and the animal nutritionists, for its ultimate solution. Limited breeding programs are under way at various State experiment stations and in cooperative programs with the Department of Agriculture. While some progress is being made, the development of superior palatable varieties of sericea lespedeza is still a goal of the future.

Land Judging

Eighteen soil conservation districts in eastern Texas sponsored land judging contests in 1956, and more are expected to do so during coming years.

By REAGAN TAYLOR

DURING the 1955-56 school year more than 2,000 4-H Club boys and FFA boys participated in land judging contests in eastern Texas. The contests were sponsored by the supervisors of 18 East Texas soil conservation districts.

The sponsors requested and received cooperation from Federal and State agencies, the public school system, bankers, merchants, clubs, and churches to help train boys and assist in putting on the land judging contests. Cost in actual dollars was low. Individual and personal assistance and participation of people was high. This was a program in which everybody worked and everybody was happy with the results.

Many man-days of work are put into preparing for these contests long before they are held. Some school officials attend district board meetings to request assistance for boys in their schools. Many hours of training are required. Soil Conservation Service personnel, county agents, and vocational teachers gave most of the training.

The training given these boys may be divided into two parts. In part I, the students are taught how to classify soils. To classify soils a boy is taught how to consider and evaluate the following factors: Soil texture, permeability of the soil, soil depth, degree of slope, amount of erosion that has taken place, degree of wetness, and the present condition of the soil. The boys learn how to use their senses of touch, sight, taste, and smell in helping determine these factors. In learning to classify soils they also learn how to determine many things concerning the soils' capabilities. They find out that soil is more than "dirt".

In part II, the boys are taught alternative treatments that can be applied to maintain or improve the soil—how to "dress it", and how to "keep it".

The training is given throughout the year in FFA classes and in 4-H Club meetings. It consists of classroom, or inside training, and on the ground field training. The students learn that there is a difference in soils—they act differently and they respond differently—when plowed, planted, or fertilized. They learn that some plants have a definite preference for certain soils, and that some plants build or improve soils while others tear them down. They learn WHY such things occur. They learn to fit plants to soils, and to select combinations of plants to use for developing cropping systems that will maintain and improve soils.

A land judging contest also requires a well-planned organization the day of the contest. The selection of the location for holding the contest is important. Sites to be judged must be accessible, close to each other, and related to each other.

The largest contest held in East Texas in 1956 was sponsored by the Shelby-Panola Soil Conservation District. Six hundred boys registered in this contest. In addition, 20 adults filled out



Winners of the 1956 Shelby-Panola land judging contest (left to right) Jack Johnson, Philip Aviola, Philip Weaver, and Rodney Edge.

Note.—The author is chairman of the board of supervisors, Shelby-Panola Soil Conservation District, Tex.



A group of contestants in the 1956 Shelby-Panola land judging contest.

scorecards. Five sites representing kinds of soils and soil conditions were located within sight and hearing distance of the school. One person emceed the whole show.

Each site was considered a field and given a number. Each boy filled out a scorecard for each field. The contestants were divided into groups of 24 boys. A group leader—one of the coaches—was in charge of each group of contestants. A field leader, another coach, helped direct the groups from one field to another and also collected the scorecards. After each field was scored and the scorecards collected, they were sent to the schoolhouse to be graded. Another coach, acting as grader of scorecards, was assisted by 30 girls. Each card was graded and tabulated. Team scores were totaled and individual high scores noted. The emcee used a public address system, loaned by an oil company, to direct the moves and field operations of all groups from his centrally located position.

Implement dealers put on an implement-operation show. The food committee and water committee carried out their part in the program efficiently.

In this contest, 12 vocational-agriculture teachers, 3 county agents, 3 Agricultural Conservation Program Service office managers, 2

Farmers Home Administration representatives, and 4 Soil Conservation Service technicians participated. Also participating, were business people, bankers, equipment dealers, and industry representatives from the towns in the district. The Center radio farm program featured soil treatment and the land judging contest on their program for that day.

Soil conservation district supervisors were elated over the response and cooperation of everybody in this important undertaking.

Those who had contests in 1956 are planning and looking forward to bigger and better participation in land judging in 1957, and other districts have indicated their desire to follow suit. They realize that many of the boys who are trained now to judge land will be the farmers of tomorrow, and they want those farmers of the future to be prepared to carry out the Lord's wishes for the land: *To dress it and keep it.*

A subscription to this magazine should make an excellent contest prize.

Hawks and Eagles in Conservation

A soil conservationist and falconer discusses the place of raptorial birds in the soil, water, and wildlife conservation programs of soil conservation districts.

By MORLAN W. NELSON

SINCE man began to keep written records the raptorial birds, such as hawks and eagles, have been symbols of nobility. Their proud stance, courage, and noble nature were better appreciated in ancient times than now. Treatment of hawks and eagles has varied throughout history. During the days of the Mongol emperors in Asia and medieval noblemen of Europe the death penalty was given to a man having unauthorized possession of these birds! With the advent of gunpowder, hawks and eagles were shot with the same impunity that man destroyed vermin. Today, their im-

portant place in the scheme of nature is better understood, and they are beginning to get the protection they deserve.

The Department of Agriculture was one of the first organizations to recognize the useful role of raptorial birds in agricultural pursuits. Over 60 years ago the Department published a bulletin entitled "The Hawks and Owls of the United States in Their Relation to Agriculture." This bulletin points out that with rare exception these birds should be protected as useful because of their rodent-killing values.

Soil conservation districts have recently become allies of hawks and eagles. Many of the supervisors and cooperators in the districts

Note.—The author is a soil conservationist, Soil Conservation Service, Boise, Idaho. He is also a trainer of wild falcons and eagles.



Morlan W. Nelson and a golden eagle he has trained for hunting.

understand the agricultural role of the raptors. They also appreciate the esthetic value of seeing a rare hawk or eagle carrying on nature's intended work in the fields or on the range. It is common to hear them refer to hawks as "mousers," now, instead of "chicken hawks" as had been the case for so long. These men have taken the lead in the conservation of soil and water, and of wildlife too, including the raptorial birds.

New studies of the raptorial birds, although not yet conclusive, point out several things of practical significance. The fast hawks, such as the prairie falcon, that are capable of catching game birds, feed very heavily on ground squirrels, magpies, bull snakes, and other creatures that sometimes prey upon game birds and their eggs.

A family of falcons, for example, catches enough destructive reptiles and mammals each year to far outweigh the few game birds they may catch while hunting over an area. Also, adult game birds of a year or older seldom fall prey to hawks; they have learned the ways of all raptors and can evade the attacks.

Many farmers and sportsmen have told me of experiences with hawks in the field: "I was walking through a field and flushed a pheasant, but before I could shoot at it a hawk swooped down and struck it out of the air." This is an unnatural situation. Actually, any bird that stays in cover is safe from aerial predators. Freezing, in the slightest amount of cover, is the most effective way the smaller birds and game birds have of escaping attack by a falcon.

When birds are forced to fly—because someone has unintentionally flushed them when the falcon is overhead—the chances are good that the falcon will make a kill. Normally, no flight would occur while the falcon was near. Nature would never give the hawk the opportunity for such an easy chance at its quarry.

Falconers using trained hawks to hunt game, strive for the very situation that others have stumbled onto by accident. The situation is all to the predator's advantage and makes it possible to kill almost any bird that flies. Such observations have led to the general belief that fast hawks can catch their quarry with ease; but in nature the hawk probably misses 9 out of



Norman Nelson and his trained prairie falcon.

10 attempts. Sometimes the hawk is killed by the evasive action of its quarry.

Falcons climb to a high altitude, circle until quarry is spotted, then attack by falling with wings folded—making use of the force of gravity to gain terrific speed. As they approach their prey, they lower their tremendous feet and strike a death-dealing blow to their quarry. Their speed carries them on past, and if necessary, they fly back into the sky for a second attack. This characteristic has given the falcons the common name of "bullet hawk."

Birds and other animals hunted by the birds of prey use evasion tactics which gives them a more than 50-50 chance of escaping each attack. I have observed many such situations, but one of the most outstanding was an encounter between my trained peregrine falcon and a female pheasant. The falcon, which had been trained to hunt crows, was only halfway to her high position when she suddenly went into her dive at something on the ground. Usually one or two dives, or "stoops" as the falconer says, is all that is necessary, but the falcon continued to stoop at her grounded quarry.



Falconer training falcon with a lure.

In an effort to see what the hawk was attacking, I ran towards the point of her stoop. To my surprise, I saw a hen pheasant, apparently out in the open, defying her speedy attacker. There were tumble weeds, sage clumps, and grass cover all within 10 feet of this pheasant, yet it stayed in the open. Most birds would have immediately headed for cover and been perfectly safe from further attack, still, this one remained calmly waiting for possible death.

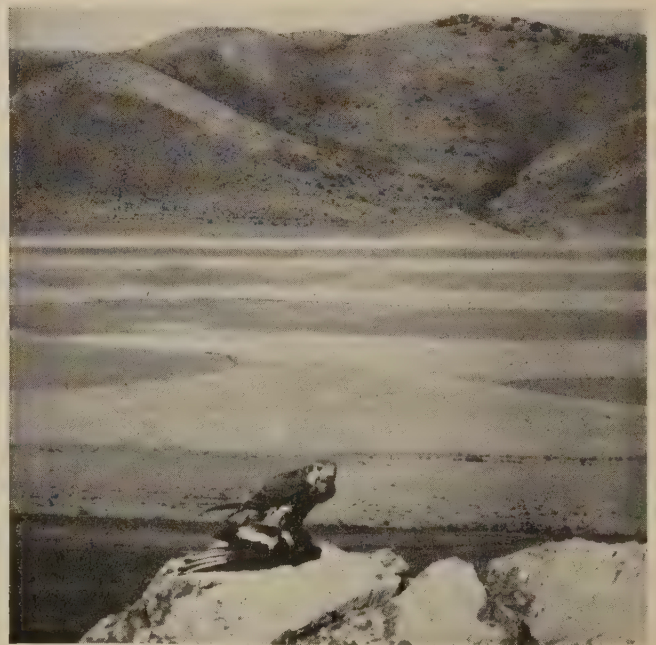
As the falcon started down in another stoop, I focused my field glasses on her and saw her zoom up sharply just before she got to the pheasant. There was a single strand of wire, the remains of an old fence, hanging about 1 foot above the ground. Had the hawk attempted to strike the pheasant, the hawk would have been killed by the wire just above it. While it is hard to say that the pheasant was actually trying to kill the predator, certainly it felt safe while underneath the wire.

Other birds and animals occasionally use cover in a similar manner, with the possibility of killing the attacker. Crows fly under three-wired farm fences for cover, and hop from side to side, always keeping the wires between them and the hawk. Magpies, pheasants, rabbits, and ducks will do the same when hard pressed by a hawk.

Most raptors have not only telescopic vision but have microscopic vision as well. But, the resourcefulness of wild game in evading aerial attack is greater than commonly thought. Even in almost hopeless situations they often come through in ways that are most effective. As an example of this type of quick action consider the following observation.

One day while hunting in Utah, I came across a large pasture that had just been irrigated. There was a very shallow pond in the lower end of the field where a lone mallard had alighted in search of food. The duck was walking in the shallow water but apparently did not want to fly because a large falcon was soaring a thousand feet in the air. If I continued to walk and the duck attempted to fly out under the circling hunter, it would most certainly be killed. I moved back into some dense cover and watched a tense drama develop. In a matter of seconds the falcon began her stoop, gathering speed as a falling stone. At that time, I would have given 100 to 1 odds that the duck's life was to end in less than 5 seconds. The mallard, however, was not to be finished so easily. As the falcon leveled out to strike, the duck beat its wings on the water. This action threw up a water spray that the hawk dared not strike against because of its speed. Each successive attack was met by the same defense until the frustrated predator decided to leave.

Of all the raptorial birds, the eagle is subject to some of the wildest of fictions. The exaggerations range from the early motion pictures that faked an eagle flying off with a baby, to a recent newspaper account of eagles in eastern Washington flying off with more than 50 lambs averaging 50 pounds each.



Prairie falcon with a magpie just captured.

The National Audubon Society has checked every story concerning babies carried off by eagles and found no actual cases on record. The eagles can and occasionally do kill lambs, but they cannot fly with anything weighing more than 8 pounds.

Also false are reports of eagles attacking humans who climb to their nesting sites. The smaller hawks, which are often mistaken for eagles and that do attack nest intruders with force, have given the eagle its reputation as a defender of the eyrie.

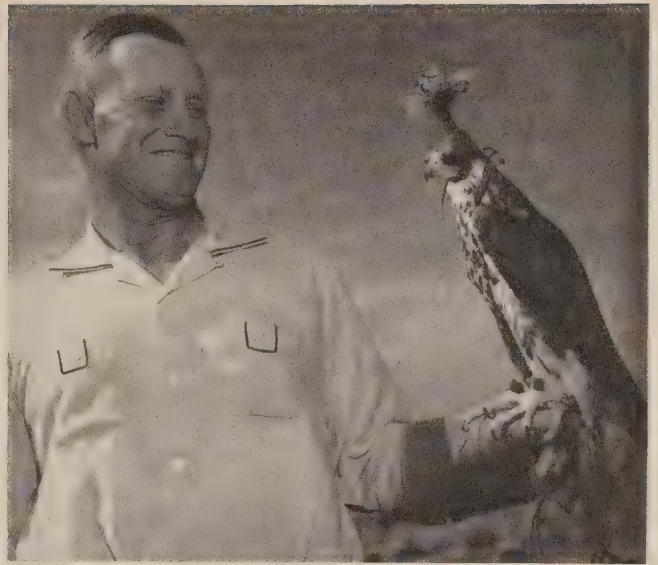
I have visited golden eagle nests in North Dakota, Wyoming, Colorado, New Mexico, Utah, Washington, Oregon, and Idaho and have never found the remains of a lamb, antelope, deer, mountain goat, or other large mammal. In all cases there were remains of jackrabbits, marmots, ground squirrels, prairie dogs, and occasionally sage hens. Also found were rattlesnakes, bull snakes, and other rare fauna.

The golden eagle is an intelligent bird. In training, it may challenge the falconer on occasion. But when properly handled and trained, it will hunt with the falconer, and will return on call from heights or distances far beyond the human eyes' scope of vision.

The feathered tarsus and dense body feathers of the golden eagle give protection against the coldest mountain or arctic weather. As a snow surveyor, I have often seen them on my long, lonely trips to remote mountain areas. My admiration rises each time for a bird that can make a living in the cold, harsh beauty of the mountains in winter. They sleep up there on those cold crags at temperatures that go down to more than 50° below zero.

Some day they may be understood by man, and at least a few allowed to live and greet those who venture to the tops of the mountains in winter or summer.

Already many of the ski resorts in western states know about the permanent residence of the golden eagle. Last year at the Snow Surveyors' School at Alta, Utah, one of these great birds hunted in the training area each day. This eagle actually made use of a beagle hound in his hunting. The dog, owned by one of the lodges, would hunt for snowshoe-rabbits. When one was chased out of cover, the eagle would sweep down and make off with dinner. The



Don Fredrickson, president of the Idaho Association of Soil Conservation Districts, with a hooded Saker falcon.

trainees soon looked forward to the eagle's visit each day—an intriguing break in their work-day.

One of the most common misconceptions of birds of prey is that they are ruthless killers; they will attack anyone or anything without provocation. Falconers have known since the dawn of civilization that these birds are the most to be trusted among all wild creatures that are trained and used by man. Through the art of falconry men have come to know the probable actions of the raptorial birds. In the end, a strange sort of relationship develops in which the bird flies loose each day but prefers to hunt as a team with the falconer, instead of returning to nature by simply flying off to the closest cliff or mountain.

Trained birds of prey always return to a lure of some type, and they are fed and rewarded each time they obey a command of the falconer. From the beginning of training this philosophy is used. When fully trained, the hunting bird will either catch the quarry or return to the lure to try to hunt another time. When quarry is caught, the falconer must go back to his hunter, because quarry taken is usually too heavy for the hawk or eagle to carry.

One of the most interesting birds of prey that visits our northern tier of states is the ger-falcon from Canada and Alaska. These birds come down from their Arctic and subarctic

nesting grounds to visit the southern edges of Canada and northern United States during the winter only. Sometimes called "white rabbit hawks," or "winterers," they represent the largest species of falcon in the world. Highly prized by ancient and modern falconers, gerfalcons are the most powerful and capable falcon that can be trained for large quarry.

Practically all states have passed laws to protect the birds of prey, but in some cases they protect only the slow hawks and allow shooting of the falcons and accipters. This affords practically no protection since very few know the difference between the many species of hawks. A new law passed by the Idaho Legislature two years ago exemplifies the ideal approach to protection by law. In effect the law states that all hawks, eagles, and owls are protected except when in the act of destroying property. This puts the burden of control, when necessary, on the farm or ranch operators and stops indiscriminate shooting of beneficial hawks.

Laws alone cannot make a significant change in the pressure on birds of any type. With the

raptorial birds there must also be an understanding of the relationship to agriculture and sportsmen. The combined efforts of sporting magazines, conservation clubs, and others are making headway, but time has almost run out on a few species of the birds of prey.

Gully Stopper

A 71-year old Wisconsin farmer comes out of retirement to stop the growth of a large gully that was bothering him.

By H. F. SMITH

FOR years Gust Fleckeisen worried about a big gully that crept ominously toward his barnyard and buildings. Gust had always taken pride in his weed-free vegetable garden and the flowers that he grew just west of the buildings. But every time he went out to work in the garden, or just to look at and enjoy, that gully spoiled everything. Not only was the gully causing serious damage, it was spoiling the appearance of the farmstead.

Gust doesn't have to worry about this gully now. He fixed it himself with a 24-inch drop-inlet structure and earth fill.

There's nothing unusual about this except that Gust is 71 years old and had quit active farming several years ago; but circumstances forced him to do this job and he proved he was up to it.

The cropland and the buildings of Gust's farm lie on benchland along the lower end of Wau-mandee Creek in Buffalo County, Wis. About 18 acres of Gust's farm drains right through the barnyard to the creek. The slope on this 18 acres is fairly steep, and the high runoff that occurs following heavy rains started the gully years ago.

In spite of all that Gust could do, the gully kept creeping toward the buildings—all the time getting wider and deeper. In 1950, he hired a bulldozer to fill it, but a "gully washer" rain in 1953, undid the work in a few minutes. After



A hunting team in the ancient tradition: gerfalcon, dog, and the falconer (Morlan W. Nelson).

Note.—The author is area conservationist, Soil Conservation Service, Eau Claire, Wis.

several other attempts to stop the gully with various methods of his own, Gust decided to build the pipe drop-inlet structure.

Being a cooperator with the Buffalo County Soil Conservation District was a big help. Gust got local Soil Conservation Service technicians on the job, and they designed a structure that would handle the gully once and for all.

The design called for a 24-inch reinforced concrete pipe that dropped the water 26 feet down through an earth fill to a safe outlet below the fill. A total of 74 feet of the concrete pipe was needed plus 23 cubic yards of concrete, 1,500 pounds of reinforcing steel, and a 20-foot section of corrugated metal pipe. The corrugated pipe was used as a propped outlet. It was extended beyond the fill to pour the water far enough downstream to prevent back-cutting.

Getting the job installed was the next problem. Gust first arranged with a local contractor to do the entire job in 1956, but the contractor was killed in an automobile accident before he started. Unable to locate another contractor, Gust decided to build it himself.

He hired a bulldozer to do the rough excavation work. A neighbor helped him dig holes and



Drop inlet above completed gully control dam on the Fleckeisen farm.

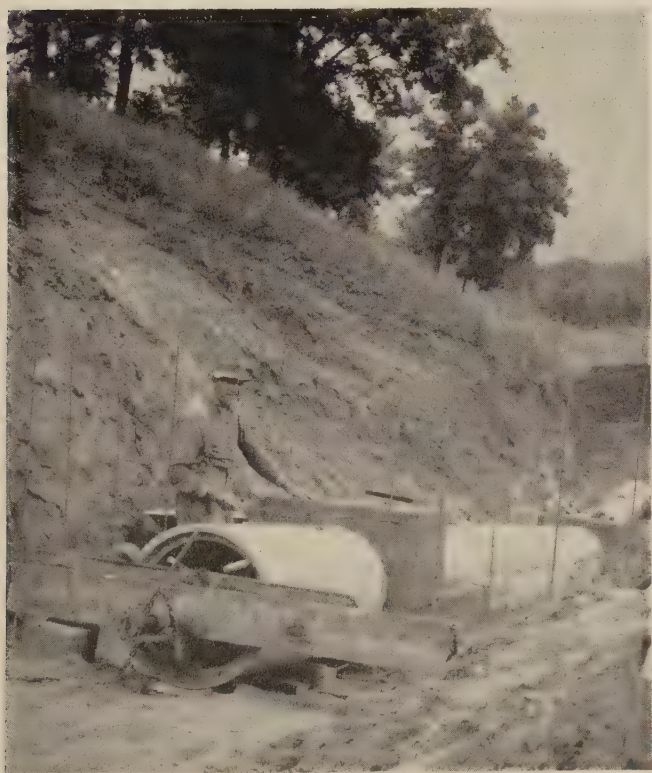
set two 16-foot pilings which supported the propped outlet pipe. Gust did the excavating by hand for the drop inlet and pipe that went under the fill and made the forms and placed the steel. He hired a neighbor with a hydraulic-loader tractor to help place the heavy concrete sections of pipe and another neighbor helped pour the concrete. He hired another bulldozer and scraper to make the fill after he had first placed and tamped fill along the pipe by hand. It took 5,200 cubic yards of earth fill to complete the structure.

An engineering aide from the area SCS office supervised and guided the construction. After the machine work on the fill was finished, Gust worked over the entire area by hand, smoothing and leveling with shovel and rake. He then manured and seeded grass on the fill.

Gust now works in his garden in peace, almost hoping for a "gully washer"—because he knows his new soil conservation structure can handle it. An eyesore has been replaced by a smooth, grass-covered fill, doubly satisfying because he did much of it with his own hands.

Fleckeisen has lived on his 173-acre farm for 60 years. He now rents out the cropland and pastures 70 head of cattle for the neighbors on his creek bottoms. He keeps most of the cropland in hay.

Gust says one reason he built the dam is that he wanted to leave the farm in the best possible condition for the next owner.



Gust Fleckeisen checking the placement of concrete pipe used as outlet for gully control dam.

Soil—Water—Wealth

A group of Montana farmers wanting to develop an irrigation project found they needed to organize a soil conservation district and call on both State and Federal agencies to help them get the job done.

By O. LEON ANDERSON

MONTANA, in many ways, is a region of extremes. Though wealthy in soil and water resources, its lack of water at the right time often tests the most rugged farm or ranch operators with all of the problems inherent to the Great Plains. Montana has severe winters, hot dry summers, searing winds, flash floods, black blizzards, grasshoppers, and other catastrophes, at times.

The operators who have learned to "roll with the punch" find Montana a glorious State in which to live. This story is about a group of

men who have learned the "art" and what they have done to bring soil and water resources together to produce new wealth.

Petroleum County, located just a little east of the center of Montana, is in the short grass country with an average rainfall of from 9 to 13 inches. Obviously, a drought in this county can really be severe. The drought over the Great Plains in the thirties didn't miss Petroleum County. From 1934 to 1940—7 consecutive years—the precipitation was below normal. Survival was a question. Many sold their ranches to the Government under the Federal land purchase program. However, there were others who stayed, and the men we write about in this story were among them.

For years they had watched the spring snow-melt from the Big and Little Snowy Mountains, some 50 miles away, flow past in Flatwillow Creek during the spring thaw. Then, before July they had seen the grass and crops shrivel and sear for lack of water.

Storage of this surplus snow water for later irrigation was the answer. The project, however, was too big for this group of men and too small for the U. S. Bureau of Reclamation; but was just right for the Montana State Water Conservation Board.

William Kruckeburg, State Water Board engineer, assisted by Clinton Hassett, of this group, located the site and made the first survey of the proposed storage dam in 1945. This site was at the junction of Flatwillow and Elk Creeks and provided a location where a large quantity of water could be stored with a minimum of yardage in the fill.

Before the project could be approved and money for its construction appropriated by the Montana Legislature, the drought was over, prices rose, prosperity returned. The dam proj-

Note.—The author is area conservationist, Soil Conservation Service, Lewistown, Mont.



Clarence R. Saylor, first chairman of the board of supervisors of the Petrolia Soil Conservation District.



Petrolia Dam that impounds 9,000 acre-feet of water.

ect was forgotten—or nearly so. Clinton Hassett, and others had memories, and they watched Big Snowy water roll past every spring.

Hassett did not let the water board forget. With frequent correspondence he goaded them about this project—the No. 1 project in the State to Hassett and others who remembered.

Finally the project was approved, and construction started on the dam on June 1, 1950. Construction work was substantially completed by July 1951. Meanwhile, the prospect of irrigation water for some 5,000 acres of Petrolia benchland changed from a nebulous idea to a clear concept. Beneficial use of this water, however, depended upon an adequate distribution system. Priority of development of land for irrigation depended on quality. The potential water users were aware of these basic facts. The need for technical information was recognized. More community action was in order. Clarence Saylor, William Welter, Ray Bohn, Leslie Thompson, and others decided to organize a soil conservation district.

The Petrolia Soil Conservation District was chartered on October 4, 1951. The first board of supervisors consisted of Clarence Saylor, Torger Sikveland, Ray Bohn, William Welter, and Isaac Iverson.

In the meantime, during the 1951 work season, under pressure from Saylor and Hassett, the area conservationist of Soil Conservation Service, they endeavored to meet the need for basic facts by: (1) Assigning the area soil scientist the job of surveying the irrigable soils to establish development priorities, and (2) setting up an engineering crew to develop a topographic map for use in planning the distribution system.

With these basic facts at hand, the board of supervisors, assisted by SCS technicians, set up the program of work. Marvin D. Hammarback was assigned as work unit conservationist. At the same time, Glenn R. Stucky, irrigation specialist for SCS in Montana, took over the job of planning the distribution system.

Working closely with the board of supervisors and the water users association, Stucky rapidly developed the plan. Fundamental features included provisions for border-dike irrigation, shallow surface drains to remove excess water, and a minimum of structures.

Land leveling started according to priority in the fall of 1951. Structures were built in order of need as rapidly as feasible.

The SCS work unit conservationist and work unit engineer were very busy keeping ahead of contractors and operators who were getting ready for irrigation in 1952.

The spring snowmelt in 1952 filled the dam to overflowing and more than 9,000 acre-feet of water were available for use that season. Water users made limited use of this water while working with feverish activity to prepare the land to receive it and the system to deliver it.

The State Water Conservation Board installed the main delivery canals of approxi-



Concrete drops that control erosion in an irrigation ditch on the Petrolia project.

mately 27 miles. The water users put in the smaller distribution laterals, both group and individual ditches, according to plan.

The project continues to develop. Water is sold at \$4 per acre plus \$1 for operation and maintenance. The approximate cost of the project was \$450,000. All of this development was completed with the cooperation of the Agricultural Stabilization and Conservation Committee.

By 1956, 21 operators were irrigating 2,240 acres of highly developed land. This is not quite half of the area that will eventually be developed and placed under irrigation. However, it is more than enough to provide a contrast.

In the drought year of 1956, the healthy green of the irrigated alfalfa and grainfields produced outstanding evidence of the value of water when applied to good soil to produce new wealth. Harvested were yields of 6 tons of alfalfa hay per acre from 3 cuttings, 50 bushels of winter wheat, and 90 bushels of oats.

Irrigated pastures that have been seeded to tame grasses—mixtures of brome, fescue, orchard, whiteclover, and alfalfa—are being developed. More than three animal units per acre were carried last summer on newly developed pasture.

Land adjustments are occurring as a natural consequence. Owners in possession of more potentially irrigable land than they can conveniently use, are trading land to pay for leveling, or are setting up new farms for their sons.

The fear of liquidation is gone; so is the need of herd dispersal for lack of feed. Production stability is coming to Petrolia Bench.

IDLE WETLANDS HAVE VALUE.—There is good use for the hundreds of acres of wetlands, according to the Massachusetts Wetland Committee. It says there are 76 excellent economic and recreational reasons why the citizens of Massachusetts should take cognizance of this great natural resource.

The Massachusetts Wetland Committee is made up of Federal, State, and private agencies and organizations that are interested in the conservation and development of the wetlands. The objectives of the committee are: To assemble information on the factors influencing Massachusetts' wetlands; to provide technical assistance to individuals and organizations interested in the conservation and development of wetlands; and to inform the public as to the value of wetlands.

MORE WATER FOR THE CROPS

A group of Colorado farmers obtained one-third more irrigation water by lining their irrigation ditches with concrete.

By RALPH BURDICK

MANY farmers in the Arkansas Valley are finding ways of increasing the water supplies, available to their crops, by making better use of water that is turned through their headgates.

A group of six landowners south of Rocky Ford, Colo., report that they have one-third more water for use on their crops as a direct result of a concrete-lined ditch they installed.

Some of these water users figure one year's increased crop production from the improved water supply will pay for their share of the concrete installation.

The concrete structure is a 16-inch ditch 2,300 feet in length. It required 84 cubic yards of

Note.—The author is farm editor, Arkansas Valley Journal, La Junta, Colo.



Water users and SCS technicians inspect an irrigation ditch where one-third of the water seeps out to support only weeds and trees.



Concrete-lined irrigation ditch that gave users one-third more water for their crops.

concrete. The lateral serves a combined total of 255 irrigated acres representing 275 shares of High Line water among the six landowners.

Results are so satisfactory in this installation that the group plans to extend the concrete lining on more of the ditch next year. The present ditch represents about one-third of the total distance.

In previous years, a full hour and a half was required for the water to travel the 2,300 feet. Now it covers the distance in seven minutes.

One of the water users, Wallace Bishop, is on the lower end of the lateral. At least three hours elapsed from the time the water was turned into the lateral at the headgate until it reached his farm. When the head finally did twist its way around the many curves and through dense mats of weeds there was often no water left for Bishop's crops.

It is estimated that fully a fourth of the water in the ditch was being lost to seepage, weeds, and trees. Several large cottonwood trees

were enjoying a healthy growth at the expense of this valuable irrigation water.

There is a vivid contrast now as trees and weeds are removed and curves straightened leaving a straight ditch for water to travel without obstruction. Although the concrete lining extends only one-third of the system, Bishop has been getting 2- to 4-hour runs of water. Furthermore, it reaches his place in about 1½ hours.

All water users on the system are realizing substantial benefits from the concrete installation. The Agricultural Conservation Program is providing assistance by paying a part of the cost. The remaining portion is being divided between landowners on the system by shares of water they own. Their cost is amounting to about \$30.00 per acre of irrigated land.

The East Otero Soil Conservation District also provided important engineering services, available from the Soil Conservation Service, in constructing the ditch. It was installed by Valley Concrete of Rocky Ford.

In addition to Bishop, the other landowners using the system are Don R. Carroll, Esquivel Elrindo, George Santisteven, Walter Butler, and Gail Edgar. They are producing such crops as sugar beets, cantaloup, onions, alfalfa hay, and tomatoes. The additional water is a major factor in expanding production of all these crops for the six farmers.



Concrete erosion-control structures in irrigation ditch.

DISTRICT PROFILE

CASSIUS HARDY
of
NORTH DAKOTA

CASSIUS HARDY is a grain farmer and Aberdeen-Angus breeder who lives about 2 miles west of Ross, N. Dak. He has 1,610 acres in his unit, a portion of which was homesteaded by his father, Harry Hardy, in 1902. In the late 1930's, Cassius and his father became interested in conservation farming and helped organize the Two Creeks Soil Conservation District. Mr. Hardy has been on the board of supervisors of the district since it was organized and was, also, the first district cooperator. With the assistance of Soil Conservation Service technicians, Hardy has developed and is carrying out a plan of operations for a well-diversified unit.

He says: "A well-diversified farming enterprise is the principal type of agricultural operation that will survive in this area over a long period of years. The operation must be based on a complete soil and water conservation program to fully utilize each acre according to its capabilities."

He has constructed stockwater developments in each of his pastures. These mechanical practices, in conjunction with a pasture management program of proper stocking and deferred grazing, has resulted in better distribution of grazing and has kept his pastures in good condition. Mr. Hardy, also, has a tame grass pasture for early spring use that gives his native pastures a chance to develop a good growth before they are utilized. He says the stockwater developments have been a labor-saver because he formerly needed to water all of his livestock at the ranch headquarters.

A grass-legume rotation system is being carried out on his cropland. Two hundred and thirty-five acres of his tillable land are now in grass. At one time there was a wind- and water-erosion problem. Hardy says that the grass-legume rotation not only has checked his erosion problems, but has built up the organic matter in the soil that leaves it in a better condition to absorb moisture. The grass and legume mixtures are harvested as feed for his livestock.

The production of grass seed on his farm, in

rows and solid stands, has given him a source of seed for his own use, as well as being a commercial source. He grows slender wheatgrass, brome grass, intermediate wheatgrass, Russian-wildrye, and green stipa.

A farmstead shelterbelt has been planted on the north and west side of the buildings to protect them from wind and snow. He plans to plant a feedlot shelterbelt for his livestock, and field windbreaks for his cropland, to reduce evaporation in the summertime and to hold more snow in the winter.



Cassius Hardy.

The purchase of a sprinkler-irrigation system has enabled Hardy to utilize the water of deep sloughs to increase the production of alfalfa hay. He reports that the yield of alfalfa has doubled since he started irrigating.

Mr. Hardy is trying a new system of fertilizing whereby he applies ammonium nitrate to stubble ground in the fall, supplemented by phosphate the following spring. He states that in other areas of our country this has been tried with success, thereby reducing the need for summer fallowing so often.

Cassius Hardy is active in civic organizations. He is a director of the Production Credit Association at Minot, a past director of the North Dakota Aberdeen-Angus Breeders Association, and is a member of the National Cattle-men's Association.

—STANLEY VACHEL

Teachers' Workshop in Arkansas

By ELSTON S. LEONARD

THE first conservation education workshop in Arkansas was held at Arkansas State Teachers College, in Conway, July 1956. The Soil Conservation Service, State Forestry Department, and State Game and Fish Commission teamed up with the State Department of Education and the State Teachers College to make this project a success.

A Committee on Conservation Education was formed in December 1955, to study the needs in this field, to do long-range planning, and to promote the teaching of conservation in the public schools. The committee decided that teacher education was the greatest need.

From this point on, subcommittees from each agency worked with Dr. H. L. Minton of the college to outline what should be taught, who

should teach, and how to use the teaching outlines that were developed.

Soil Conservation Districts assisted to insure an enrollment of at least 20 pupils. They offered \$50 scholarships to pupils qualified and willing to take the course and become pilot teachers in their respective schools. Scholarships were also offered by county wildlife associations and wood products companies.

The instruction was divided into five areas: Soils, Water, Forests, Wildlife, and Minerals.

A soils man, an engineer, and an agronomist gave the instruction on soil and water the first 4 days of the three-week course. Ten specialists in the field of Forestry covered this subject in the next 3 days. Four specialists covered the field of Wildlife during the following 3 days. Dr. Minton was moderator and college repre-

Note.—The author is work unit conservationist, Soil Conservation Service, Little Rock, Ark.



Arkansas school teachers studying a soil profile under direction of the State soil scientist of SCS.

sentative in the course. He covered Minerals and coordinated all the other phases into a well integrated program on conservation.

The student-teachers were divided into committees for each area of instruction for the purpose of evaluating and preparing material that will be distributed to schools throughout the State.

The college gave 3 hours of graduate or undergraduate credit and furnished a bus for field trips.

The course proved to be very popular with the students. The State Teachers College plans to conduct another workshop in 1957.

FERTILIZER WASTE IN APPLICATION.—Crop yields are directly affected by the way fertilizer is applied, according to tests made by soil scientists and agricultural engineers at Michigan State University. In muck soil tests, the researchers found that method of application made as much as 103 percent difference on onion yields and up to 50 percent on spinach yields. From the research, the scientists concluded that fertilizers for these 2 crops should be placed in a band 2 inches below the seed level or in a band 1 inch to the side and 2 inches below the seed level. If more than 800 pounds per acre of a fertilizer like 5-10-20 is to be applied with row spacing of 16-18 inches, the excess should be put on ahead of planting with a fertilizer grain drill, be broadcast on the surface, or plowed under.

SHELTERBELTS STOP SOIL LOSS.—William Carlin and his son Hubert in Sherburne County, Minn., put in a mile of shelterbelts along the west and north sides of the farm in 1942. Most of the jack pine, cottonwood, and red cedar trees are about 20 feet high now, and protect 160 acres of soil. "We can easily tell the difference," says William Carlin. "Years ago, there used to be a heavy cloud of dust blowing across the highway on windy days. Now we seldom see any soil blowing."

—*The Conservation Volunteer, Minn.*

PINES FOR PROFIT

(Continued from page 198)

Help is provided in making decisions on the long range land-use plan. The woodland farmers get assistance on the species to plant, the time to plant, and help in actual planting. Older pine is marked for harvesting and sold on a cutting-cycle system.

Yes, the cutover slums are going and gone. Where one professional forester worked in the county in 1939 many are active now, including 16 who are consultants or employed by industry.

McCurtain County, Okla. came out of the woods by growing more trees. Before, they farmed much of the wrong land. Now, their transgressions are being corrected gradually. It's an agricultural transition—in its more stable phase.

DIRECT-CUT SILAGE WASTEFUL.—The direct cut silage-making method isn't recommended for high moisture forage, according to recent research by University of Wisconsin farm engineers and dairy scientists.

They found that nearly half the total forage weight and more than one-eighth of the total dry matter was lost in liquids draining out of the silage.

The researchers cut legume-grass silage at less than one tenth bloom and put it directly into the silo. Moisture content of the fresh-cut forage was 86 percent as it went into the silo.

They collected the runoff from the silo pits and found that the runoff contained 13½ per cent of the dry matter put into the silo. This is an expensive loss of good proteins, vitamins, minerals, and energy.

Cutting forage early (at one-tenth bloom) is fine, the researchers say. But, it's also likely to have a high-moisture content, so it should be wilted before it goes in the silo.

An aerial photograph of a large agricultural field. The field is divided into numerous long, curved, parallel furrows that create a terraced effect. The furrows are dark and appear to be filled with water or are very recent, contrasting with the lighter, drier soil between them. The furrows curve from the foreground towards the horizon. In the far distance, a flat landscape with some small structures and trees is visible under a pale sky.

MAY 1957

SOIL CONSERVATION

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION.

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SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

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U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

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INTERLOCKING PROGRAMS.—“Research, education, technical services, and cost-sharing all are designed to help preserve or restore the physical characteristics of our agricultural lands so that a stable agriculture will be assured.”

—National Bulletin, ACPS, 1957

LIMING.—Putting all the lime on a field before plowing is as good as the split-application method, according to University of Wisconsin soil scientists J. R. Love, A. E. Peterson, and L. E. Engelbert. They have found that the important thing is to mix the lime thoroughly with the soil.

On one field, all the lime was put on and disked in before plowing. On another, the lime was put on and disked in after the field was plowed. On the third, the researchers used the split application.

All the fields were seeded to alfalfa in 1952. In the second year of alfalfa, the researchers made stand counts and found no difference for any of the treatments.

Total hay yields for the 3 years were the same for the split-application method and where all the lime was applied before plowing, the researchers say. Where all the lime was put on after plowing, hay yields dropped about one-quarter ton a year.

Editors are invited to reprint material originating in this magazine.



FRONT COVER.—Contour lister furrows holding water for crop production and watershed protection in western Oklahoma.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Land Judging Expands

Land appreciation schools and land judging contests become more popular from year to year in all sections of the country.

By TOM DALE

EDD Roberts competed in livestock judging, poultry judging, crop judging, and various other judging contests throughout his college career. He thought he learned a great deal about better crops and livestock from these contests. The direct competition against fellow students spurred him to study harder and listen more intently to his instructors.

Soon after he became Extension Soil Conservationist for Oklahoma, in 1937, Edd began to search for ways to teach soil conservation more effectively to the farmers and young people of the State.

Why not have a contest? That should, at least create more interest; and, when you get people interested they are likely to learn. That, says Edd, was his method of reasoning when he set out to promote the first land judging contest of the Nation. He got together with Harley Daniel, who was director of the soil conservation experiment station at Guthrie, Okla., and the two of them sold the idea to many other conservation leaders of the State.

In October 1941, about 25 farm boys assembled at the experiment station for the first land

judging school and contest. The results were gratifying. The contest became an annual affair. Participation increased from year to year. The school and contest was expanded to include adults, both men and women, as well as 4-H Club and FFA members.

The land judging idea met with such great public approval that within a few years many local and area contests were being held. By 1948, such schools and contests had been held in every county and soil conservation district in Oklahoma. In the meantime the idea began to spread across State lines. Roberts gives W. R. Tascher Extension soil conservationist of Washington, D. C., most of the credit for promoting land judging contests in other States. But, Tascher says most of the credit should go to the State Extension soil conservationists, soil conservation district supervisors, and SCS leaders in the States.

By 1951, Roberts, Tascher, and other conservation leaders from various States decided it was time to promote a national land judging contest. They laid their plans. They got a group of Oklahoma City businessmen and the WKY radio and



Activities at the 5th annual land judging contest, near Oklahoma City.



Illinois Future Farmers of America fill out score cards in a land judging contest.

television station to sponsor the event. In 1952, the first National contest was held near Oklahoma City. Its success surpassed all expectations. It, too, became an annual event and continued to grow.

By 1956, land judging schools and contests were being held in 40 States and Hawaii. State leaders estimate that around 175,000 people participated in the local, area, and State land judging activities that year. About 75 percent of these participants were FFA boys, 4-H Club members, and other youth groups. The remainder were mostly farmers and other men,

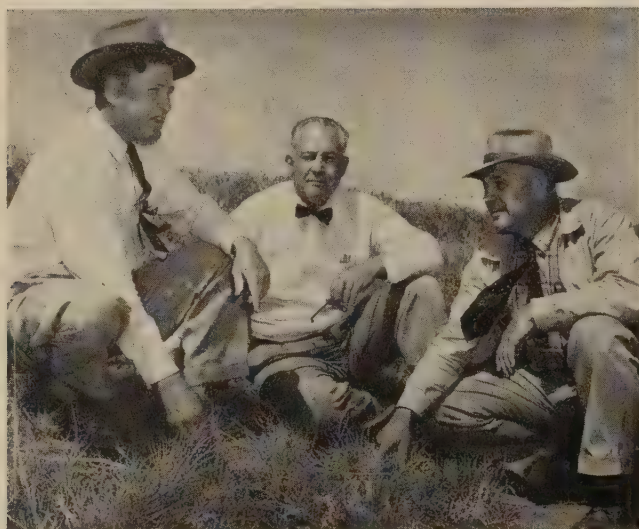
with a smaller number of women and girls.

Soil conservation districts, Vocational Agriculture instructors, and county agents are the principal promoters and sponsors for most of the local contests. But chambers of commerce, civic clubs, garden clubs, industrial organizations, bankers, radio and TV stations, newspapers, and numerous other organizations also sponsor land judging contests. In some of the contests the prizes are nominal; in others substantial cash or merchandise prizes are awarded to the winners. In all cases, the participants, both young and old, are learning more about how to judge land—how to determine its capabilities, how to use it, and how to care for it.

The sixth National contest is being held at



4-H Club group in Arkansas compete in a land judging contest.



Promoters of National pasture and range judging contest discuss plans. (left to right) Clarence Bunch, range specialist, Edd Roberts, soil conservationist, and R. E. Chiles, pasture specialist, all of the Oklahoma Extension Service.

Oklahoma City during the first week of May 1957. Cash awards of \$2,500 are being offered to the winning contestants. Roberts thinks this contest will even surpass that of 1956, when 487 contestants from 23 States, and representatives from 15 foreign countries participated.

Actually, there will be 5 different contests in this National land judging event. Separate contests will be held for 4-H Club members, FFA members, college students, adult men, and women and girls. The FFA, 4-H Club, and college contests will be for both individuals and teams, a team constituting 4 boys from the same school or county. The other groups compete only as individuals. Each State is limited to 5 each of FFA and 4-H teams in order to expedite things. In most States the teams are selected from area or State contests held prior to the

National contest. Individuals who have previously participated in the National contests are ineligible.

In addition to the land judging contest, the Oklahoma City affair also includes a National range and pasture judging contest. This contest was added a few years ago on demand. It includes identification of desirable range and pasture plants as well as judging differences in range and pasture conditions and capabilities. It has become almost as popular as the land judging contest during the past few years. Local, area, and State schools and contests are now being held in many States. This, also is divided into five separate contests with the same groups participating as in land judging.

The land judging contest itself is fairly simple. The judges, in advance, select four or five fields with varying potentialities. The contestants are given a score card on which they must indicate their judgment as to the capabilities and productivity of each field, and also set forth their suggestions as to suitable cropping systems and conservation measures needed. Their answers are checked against the judges deci-

sions and a score recorded for each contestant on each field. The one who most nearly approaches the judges decisions on all fields wins.

During the 16 years since land judging contests started, they have become almost as popular as livestock judging contests, especially among FFA and 4-H Club members. In several States, land judging has become even more popular than livestock, poultry, or crop judging, because so many people are coming to realize that the land is the basic resource that supports all other agricultural enterprises.

W. R. Tascher, an avid supporter of land, range, and pasture judging contests, states: "We are happy to see the widespread interest and participation in these National, State, and area contests. They are great motivating events. But, there is almost universal agreement by those experienced in land appreciation schools and land judging contests that the major educational values come at the local level, where the would-be contestants get their instruction and training from Vocational Agriculture teachers, county agents, soil conservationists, and conservation-minded farmers and ranchers."

Crops Against The Wind

The farmers of western Texas are making a valiant fight to protect their land against wind erosion, mainly by proper use of crop residues supplemented by emergency tillage.

By C. A. TIDWELL

STUBBLE fires were a common sight in the Plains country of western Texas 10 or 15 years ago. The stubble was burnt to dispose of what was considered worthless residues as the first step in getting ready for the next crop.

This practice has entirely disappeared from the Plains scene. Most farmers now cherish their crop residues—call it "trash" or "litter" if you prefer. It can do wonders to protect the soil against wind erosion, and is of real value in keeping the soil in condition to soak up and store moisture.

You can drive mile after mile along the highways in this area now, and see nothing but trash-covered fields. You will also discover that most farmers put forth extra effort to keep the residues—the leaves, stalks, and stubble—on the land to protect the surface of the soil against the wind during the winter and spring months. Furthermore, you will find many farmers trying in one way or another to improve their cropping practices by using grasses and legumes in rotation. This reflects a better understanding of the hazards of farming in this part of the State.

The past 15 years have brought many changes to the agricultural landscape in this broad, almost flat land. Most of the changes have been

Note.—The author is assistant state conservationist, Soil Conservation Service, Temple, Tex.



Shredded sorghum stalks that serve as a mulch to help protect the land against wind erosion.

in the course of progress. Nearly all of them—but not all—have been good.

One of the things that is not so good has been the trend toward breaking up big ranches into farms. Some of this has been done without considering the limitations of the soil. Owners and operators of some of these new farms are finding that, even where they have irrigation water, trying to farm these soils is very hazardous.

One of the good things has been the gradual disappearance of the one-way plow as the primary farm implement on wheat farms. In its place has come the sweep-type plow that cuts under the soil's surface, leaving surface litter undisturbed while destroying moisture-stealing weeds. A large percentage of the Plains farmers now are using sweep-type plows either alone or in combination with the one-way plow.

Irrigation in this area has doubled and doubled again in the past decade. It has brought about a great change in the economy of much of the country. It has moved northward in recent years into the wheat-growing lands north of the Canadian River.

Cattle still graze large areas of the Texas Plains with large units still in operation. Sheep ranching also is carried on in the southern part of the Texas Plains. But, the conservation ranchers now gear their livestock numbers to the condition of the range in wet years or dry ones.

Hence, livestock numbers have been reduced drastically during the recent drought.

Soil conservation districts for a time seemed to be groping in the dark. Now, they seem to realize the size and importance of their assignment. These locally-led districts have taken their places as a guiding force in the Plains agriculture.

For several years, the SCS and cooperating agencies have been keeping a close check on the lands of west Texas where soil blowing is a serious winter and spring problem. In these years the drouth has slowly widened its hold. But, without the great efforts put forth by farmers and ranchers and the work of soil conservation district supervisors, the situation would have been many times worse.

Reports are received regularly on wind-erosion conditions in 68 counties of western Texas each year, from November until June. These are the months when most wind damage occurs. These counties cover more than 41 million acres. Of these, less than 6 million acres were without sufficient protective cover to prevent damage by winds during the past blowing season.

For the remaining 35 million acres of land with good, erosion-bucking cover, we in Texas can give our thanks. On these lands, millions of acres of grain sorghum and other residues have been left undisturbed, or they have been



Blue panicum that was grown in a grass-grain rotation in western Texas.



Stripcropped field of cotton and sesbania, a legume, in western Texas.

shredded and the litter tucked into the soil to anchor it.

A large part of this land is in the Terry, Cochran, Hockley, Blackwater Valley, and Lamb Soil Conservation Districts where, on non-irrigated lands, very little grain was produced last season. The stalks, in spite of the failure of the grain to mature, could have been cut for feed or grazed by livestock. But, much of the residue was left in the field for soil protection.

Large areas in these districts are of such nature that disaster occurs if the land is left unprotected in winter months. This applies to lands under irrigation as well as to nonirrigated lands. These soils must have cover—living or dead—to escape damage.

It is considered something of a phenomenon that such soils can actually start to blow within half an hour or so after a rain. A hard, drying wind can take the moisture out of the soil's surface rapidly, leaving the surface particles of soil to be picked up. But, they seldom blow where adequate cover is left on the surface, as has been the practice of so many farmers.

The heavier, tighter soils in other districts also are vulnerable to the forces of wind and drouth if left unprotected, although they may hold against wind damage for a somewhat longer period.

Several farmers have been growing legumes interplanted in the same row with sorghums. This practice has been followed principally on

irrigated land. Additional nitrogen is added to the soil in this manner, and the shading of the ground to prevent evaporation seems to outweigh the additional moisture demands of the legume crops. The grain can be easily harvested without interference with the shorter growing cowpeas or Mung beans. Grain yields have been sustained, and improved soil condition has been the result.

Farmers in the row-crop section still rely heavily on tillage operations for wind-erosion control. Tillage methods are undergoing a change to provide a maximum amount of cloddiness and surface roughness. Chisel- and sweep-type implements are being used in supplementing residues while listers are being used chiefly for seedbed preparation. These methods may be quite effective in wind-erosion control for short periods. Seldom, however, can tillage methods be fully effective if high winds persist throughout the winter and spring.

Some farmers are using millet as a standby crop to get cover. It can be planted in late summer and, on little moisture, will produce enough residue to protect the land until the following spring.

Though we still have some dust storms in Texas, and some farmers and ranchers are not doing all they should to protect their land, the picture as a whole is one to warm the heart of a soil conservationist. It is apparent that the large majority of the farmers in this big area

are making a sincere effort to protect their land. They are finding ways to use their land in harmony with conditions imposed by this fickle climate. They are working toward cropping systems that will leave protective cover, living or dead, on their land at all times.

That is a goal we have been striving for in the Texas Plains—trying to be ready for the dry years and the winds whenever they come, and to make the best use of the moisture we have. And, the results, so far, have been surprisingly good during this worst drought since the settlement of the Plains.

A WOODLAND FARMER

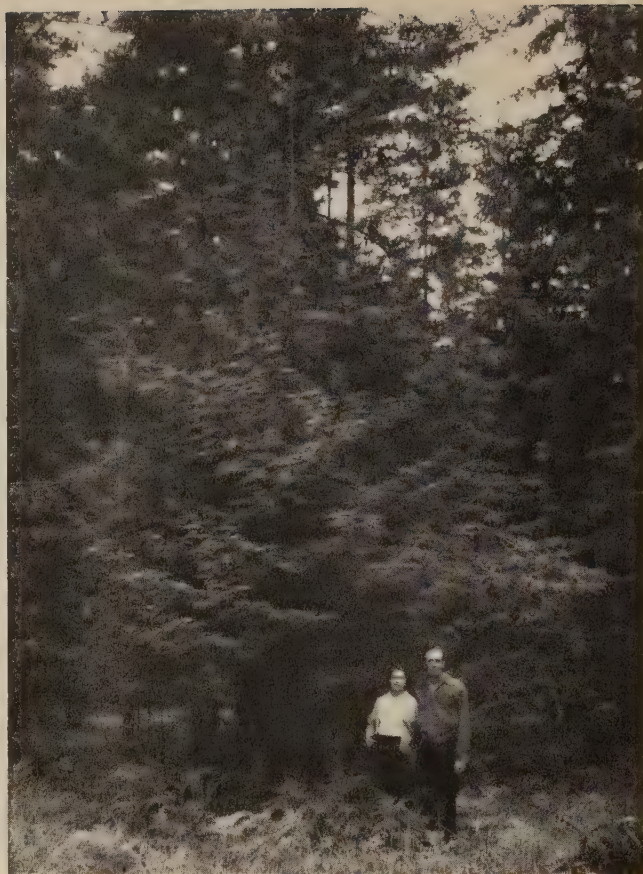
James Parrott, a cooperator with the Willits Soil Conservation District, Calif., appreciates trees. He came from Kansas where trees are scarce. The redwood and Douglas fir of the Pacific coast really look good to him. They also appeal to his wife who was born in South Dakota.

After working in aircraft plants in southern California and spending a period of time of service in the Air Corps, Parrott found 160 acres of timber for sale. He purchased this in 1947 for \$5,000. Later, he purchased an additional 200 acres. In 1950, he sold \$25,000 worth of stumpage from his acreage. Immediately following this sale, he salvaged all salable logs, putting some through a small portable mill that he constructed himself. This brought in about \$20,000 net profit. There is still a good residual stand on the land. His earnings have been applied to the purchase of additional cutover land and equipment.

He now owns about 1,300 acres, most of which is covered by young growth Douglas fir and redwood. Roads are being improved to permit better utilization.

From the beginning of his operations, Parrott sought and followed advice of SCS technicians serving the Willits Soil Conservation District. Practices applied in his woodland include fire protection, selective harvesting of mature trees, thinning of young stands, salvaging of suppressed and defective trees, and fire hazard reduction by cleaning up logging slash. The young trees are now growing at the rate of one inch in diameter per year, following improvement cuttings made in the young redwood stands.

Parrott has a progressive attitude toward his woodland-conservation operations. In 1945, a forest fire burned a portion of the ranch he later acquired. The seed source was destroyed, so planting was necessary on a portion of the burn. He tried planting with Douglas fir seedlings dug up from adjoining areas that were well stocked. This planting was made in 1947 and the



Mr. and Mrs. James D. Parrott in second growth Douglas fir on their woodland farm.

trees now are about 30 feet high and growing rapidly.

He tried pruning young redwood trees, but found that this only produced new limbs on the boles of these young stands, and apparently did not add to the main growth. He observed that leaving limbs and tops of trees on the ground caused the buildup of a beetle population that killed many of the Douglas firs. He is currently salvaging these bug-killed trees.

Parrott's present plan is to log and sell about 200,000 board-feet per year. This cut can probably be increased after building up his growing stock.

He has cleared an airstrip and purchased his own plane. This enables him to keep a careful watch over his woodland and spend less time away on business trips.

His present woodland job is cutting diseased and insect-infested trees and salvaging dead and down timber. This material is being stockpiled to be sawed in his own portable mill.

Trees and tree farming have been good business for this family. This was summed up by Parrott when he said, "This is a good place to live. Trees grow so well here that I cannot understand why anyone should waste time and money trying to clear this land. I intend to grow trees."

—ROBERT A. DELLBERG

Interplanting in Corn

Two scientists report on research results of interseeding grass and legume crops in corn.

GRASS CROPS BETWEEN WIDE-ROWS

By W. E. LARSON

THERE has been considerable interest in seeding grain or forage crops between corn rows. Before the tractor replaced the horse, wheat, rye, or a forage crop was often seeded between 40- or 42-inch corn rows with a one-horse drill. As tractors replaced horses this practice slowly died out.

In 1951, however, Springfield and Thatcher, in Ohio, reported that forage stands were frequently improved by widening the corn rows. They also reported that corn yields from wider row spacings were not reduced as much as

Note.—The author is soil scientist, Agricultural Research Service, U. S. Department of Agriculture and associate professor of soils, Iowa Agricultural Experiment Station, Ames, Iowa.

No. 22

This is the twenty-second of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

earlier supposed. This discovery opened up a new line of approach.

If corn-row widths could be widened to 60- or 80-inches, possibly a small tractor could operate equipment between the corn rows during the growing season. In this way forage crops could be planted between the corn rows after the corn was laid by. The forages could be used as green manure or saved for pasture or hay.

Experiments were started, in 1952, by the U. S. Department of Agriculture and the Iowa



Legume and grass mixture interseeded in 80-inch corn rows.

Agricultural Experiment Station to determine how successful forage stands were in Iowa when seeded in 80-inch corn rows after the last corn cultivation. Also, to determine how corn yields compared in 40- and 80-inch rows.

During the first few years, the seedings in 80-inch corn rows were made in late June or early July. Forage stands were generally unsuccessful in all areas except the northeast portion of the State. It was found, however, that stands were generally better from seedings made in 80-inch corn rows than in 40-inch rows. Corn yields from 80-inch rows were generally 75 to 80 percent of those in 40-inch rows.

It was thought that better forage stands might be obtained by seeding in midspring or early fall. Thus, the experiments, in 1955 and 1956, were designed to study the effect of dates of seeding forages in 80-inch corn rows on forage stand and on corn yields. This series of experiments pointed out that forage stands were more likely to succeed if made after the first corn cultivation than if made later. In some cases, corn yields were reduced by elimination of the last cultivation, but this reduction was not marked. Meadow seedings, made at corn planting time in 80-inch rows, were generally successful, but corn yields were drastically reduced. Seedings made during August have not been successful during the last 3 years.

While forage seedings in wide-row corn in Iowa have not been too encouraging during the past 4 years, the State has experienced one of the most severe droughts on record in this period. Thus, the experiments may not be a good indication of what can be expected in normal years.

These studies have led to several tentative conclusions. It appears that a corn-row width of from 60 to 80 inches is most desirable. The experiments have indicated that under good conditions corn yields from a 60-inch row will be better than from an 80-inch row. However, increasing the row width to at least 80 inches has advantages; having at least 80 inches between rows is necessary for operations of most small tractors between the rows. This is important, since it is frequently desirable to mow weeds between the rows. In addition, if spring seedings fail, it is then possible to prepare a seedbed for a fall seeding.

Control of weeds is facilitated by use of a corn planter equipped with furrow openers; soil can be thrown into the corn rows to cover weeds without ridging the soil. Ridging should be avoided if hay is to be harvested the following year. Corn populations should probably be about 12,000 plants per acre in 80-inch rows.

It appears that chances of obtaining forage stands are best when plantings are made early. Probably, the seedings should be in early June, after one or two cultivations of the corn. Experience has indicated that a small roller or packer should follow seedings. Cultivation without packing, leaves the soil loose and encourages poor and spotty stands.

LEGUMES SEEDED IN CORN

No. 23

This is the twenty-third of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By ORVILLE E. HAYS

RESearch during the past 4 years, in Wisconsin, has shown that corn may be used as a nurse crop for legumes such as alfalfa and clover. Procedures have been developed whereby stands of legumes are as good as those obtained from seeding in small grain.

The corn must be planted in wide-spaced rows for best success in this interseeding. Normal-spaced rows of high-population corn allow insufficient light to the legume seedlings for good growth and survival. Best success has been obtained with corn rows spaced at 60 inches, but with the corn population per acre the same as on 40- or 42-inch rows.

Note.—The author is project supervisor, soil and water conservation branch, Agricultural Research Service, U. S. Department of Agriculture, LaCrosse, Wis.

The plow-plant method of growing corn is well adapted for interseeding, as the corn can be cultivated with less ridging than is usually done. In plow-plant, the land is plowed 1 or 2 days prior to planting corn. If a good job of plowing is done, there is no need for cultivation between plowing and planting. If old hay is being plowed under, it is well to cultivate once with a field cultivator or disk before plowing.

In plow-planting of corn, the tractor wheels and the corn planter are adjusted so that the corn is planted in the tractor tracks. The corn is not cultivated until it is 6 or 8 inches high. Normally, two cultivations are all that are necessary for weed control. The first cultivation fills in the depression caused by the tractor tracks at planting time. At the second cultivation, the cultivator shovels should be adjusted so that the minimum amount of soil necessary for weed control is thrown to the corn row.

If the corn-plant population per acre is the same in the 60- and 40-inch rows, the yield of corn will be reduced by about 10 percent by planting in the wider-spaced rows.

Legumes are interseeded when the corn is 15 to 25 inches tall. Earlier seedings are apt to encourage weed infestation which, if not controlled, will greatly reduce the yield of corn and frequently smother out the legume seedlings. Clipping, or the use of herbicides, will protect the legume seedlings. However, the early seeded legumes, even with weeds under control, will compete seriously with the corn for soil moisture and greatly reduce corn yields. For best results,



Forage crops seeded between 60-inch corn rows.



Second year growth of alfalfa that was interseeded in wide-row corn.

seeding should be delayed until the corn has been cultivated twice and is at a height of 15 to 25 inches.

The method of seeding needed for good stands is to a large extent dependent upon soil moisture and climatic conditions at the time of seeding. Broadcast seeding has been found successful either on soils high in moisture, or if adequate rainfall occurs soon after seeding. Complete failures have resulted when the legume seed was broadcast on dry soil. Dry surface soil requires that the soil be packed firmly around the seed.

Two types of seeders have given good results. The cultipacker seeder has been successful even in soil low in moisture. The unit used applies fertilizer in front of the cultipacker and drops the seed between the cultipackers. It is similar to the regular cultipacker seeder but is narrow enough to use between corn rows.

Another unit used with success, even in dry soils, is the mounted grain drill equipped with press wheels. With this unit, the corn can be interseeded while it is being cultivated. A drill assembly is removed to allow the corn to pass under the drill. The seed released at this point is broadcast over the row and will, under favorable conditions, germinate and become estab-

(Continued on page 234)

Something Is Happening —

—In Our Small Watersheds

By TARLETON JENKINS

“WATERSHED” is a word that has recently come to life. It is a word that has gained new and more interesting meanings. It suggests changing and challenging ideas for the use and improvement of watershed areas. This new way of looking at watersheds has captured the imagination of citizens in almost every section of the country.

Farmers are farming better in areas where the new watershed principles are being applied. And, both farmers and the residents of nearby towns and cities are enjoying a new freedom from costly floods.

Utilities, highway departments, and railroads are noting fewer interruptions in the services they provide. Municipalities like Duncan, Okla., and Kaufman, Tex., are discovering new sources of much-needed water in the development of their watersheds.

Wildlife has been given a helpful boost with new water sources and with streams returning to primitive vigor, while landowners put forth extra effort to improve habitat and plant food and cover for game. Residents of watersheds have been enjoying near-at-home recreation—fishing, swimming, boating, picnicking, hunting, and the like.

Watersheds are everywhere. Wherever you are, you are bound to be in a watershed if you are on land. The term “watershed” simply means an area that sheds water into a given stream, pond, or lake.

Some watersheds, like the Mississippi, the Colorado, and the Columbia, gather the runoff waters from big patches of the continent. But the big ones are only jigsaw composites of the small watersheds. It is these creek-size watersheds that are now claiming the attention of almost everyone concerned with the use and conservation of water.

There are few parts of the Nation, whether in semiarid regions or in those of higher rainfall, where opportunities for developing small watersheds are not being weighed.

Third Creek, in West Virginia, which drains a watershed of 60,000-odd acres, is one example of how watershed treatment is helping the area's agriculture.

J. W. Lackey, who has 85 acres of land bordering Third Creek, has seen many floods during the 30 years he has farmed there. He has only 8½ acres of bottomland, but it is the best land on the farm.

Not long ago, crews completed a floodwater-retarding structure above the Lackey farm. It is one of 11 designed for Third Creek and its small tributaries. When a 9-inch rain fell in 3 days on the watershed there was no flooding of



Flood prevention structure on Green Creek watershed, Tex., during rainstorm, when this

Note.—The author is information specialist, Soil Conservation Service, Fort Worth, Tex.

the Lackey bottomland acres. It was the kind of rain that, before completion of the floodwater-retarding work plus the land-treatment measures that go along with it, would have sent Third Creek out over nearly all the bottomlands. The dam easily kept the creek flow within banks.

Mr. Lackey was pleased. "I'm satisfied water would have covered the corn and ruined my crop if it hadn't been for the flood-prevention work," he said.

Will Webb, with 100 acres of good bottomland, Sam Jones, and J. T. Graham, all neighbors of Mr. Lackey, soon can farm their own rich bottomland soils without the threat of floods.

Sandstone Creek in western Oklahoma was one of the first creek-sized watersheds to get the full treatment for flood prevention. By 1952, the 24 floodwater-retarding dams in the Sandstone Creek plan were in place, and the needed soil conservation measures applied on well over half the watershed's 65,000 acres.

Before this, Sandstone Creek had been averaging 9 floods a year. Some were small floods, but they nearly all came during planting or growing seasons. All of the floods took a toll in damage to soil, crops, and property. These floods were costing \$60,000 a year on the average.



...e pool was filled almost to maximum capacity after a heavy
...ure was taken.

Since Sandstone Creek has had its flood-prevention work, there has been no costly flooding of its bottomlands even though the sudden storms have come about as usual.

In April 1954, for example, a 2.2 inch rain fell. The soil of the drainage area already was saturated with 2 days of rain. And, because of the drouth, vegetative cover was in poor condition. These factors made the runoff of 1.4 inches unusually high for that much rain. Flooding during that storm was limited to 588 acres. Damage was figured at \$2,800. Without the soil conservation and flood-prevention work, it was estimated that 2,160 acres would have been flooded with damages of \$25,800.

One thing the residents of Sandstone Creek watershed are proudest of is the clear stream that now flows most of the time. In 50 years or longer, it had only flowed during rainy spells. The flow from November 1953 to July 1954, was 234 days at an average of 32.7 acre-feet a day. The flow since that time has been almost continuous.

Some of the farmers in Sandstone Creek watershed report interesting benefits that previously had not been taken into account. They say the water that stands briefly in the detention pool areas, behind the retarding dams, soaks deeply into the land. It has meant unusually good yields in grass.

Green Creek watershed, in west-central Texas has undergone a flood test. It is one of 60 pilot watersheds for which Congress appropriated funds to get the work on small watersheds underway.

Only 3 of the proposed 13 floodwater dams were complete in April of 1956, when one of the intense rains, for which the area is noted, began. However, a large percentage of the needed soil conservation treatment was on the land.

E. C. Johnson, chairman of the Green Creek Watershed Association reported: "In the flood last spring, the value of our cooperative watershed work was vividly demonstrated. Without this work, a large volume of water would have gone into the Bosque River when it was already at flood crest. Damage to the farm lands and to the city of Hico would have been far more devastating. The 3 structures released floodwater at the rate of 18 million gallons a day for 22 days."



Downstream face of Pine Creek flood-detention dam, Walnut Creek watershed, California, with draw-down outlet in foreground.

A Green Creek farmer, J. L. Kiker, said: "This is one of the most beneficial things to come to this community. Protection of the soil is, I think, the biggest benefit. I had to retire my best land to grass years ago because of the flooding. Now I am putting it back into cultivation. The protection of fences is another benefit. Keeping the water in the creek channel keeps all the roads passable, whereas it used to be that for 3 or 4 days after a flood I couldn't get my car away from the house. Then too, you have to consider the fishing, boating, and wildlife we enjoy now. It all makes this community a better place to live, to farm, and to play."

Another of the pilot watershed projects is Walnut Creek in California. It is a small mountain-fed stream with an ugly record for flooding.

In December 1955, flooding was severe through northern and central California. Eight inches of rain fell in 48 hours in the Walnut Creek watershed. A newly completed floodwater-retarding dam held all of the water that came rushing from the drainage area and eased it into the protected channel. The same kind of a storm in 1951 covered 5 blocks of residences with water.

Gerald S. Deardorff, Star Route, Danville, Calif., remembers the 1951 flood vividly: "It was of less intensity than this 1955 storm," he

said, "but it was necessary to use boats to evacuate women and children. Water ran up to 4 feet deep in houses."

In a Ventura County survey by farmers and soil conservation engineers, the group was impressed by the effects of good ground cover during the December rains. They reported "amazing amounts of water were soaked up, reducing runoff to such an extent that little damage was done."

The Upper Salt Creek watershed near Lincoln, Nebr., also has a long history of flooding. This watershed is taking on a new look, with a system of floodwater-retarding structures to support the soil conservation measures on the farmlands.

The flood of 1950 was one of the region's most destructive. It ripped up soil, destroyed crops, wrecked buildings and fences, and drowned livestock. Cities and towns downstream suffered, too.

Jerry Kubik's farm was one of those taking a severe beating in the 1950 flooding. "There was just nothing to hold the water on the land," Kubik recalled. "The water came down the hill-sides and took out my corn. It cut my new-plowed land away, down to the plow sole. But, this can't happen to me again. All my farming now is on the contour with plenty of protection for the soil from plant cover and residue. Rain soaks in now, and the rest takes its time running off. It takes days for all the water to run off, and when it leaves it is clear water, no longer muddy."

The floodwater dam on Kubik's farm is capable of controlling 3.6 inches of runoff. The dam's site (as are all such upstream structures in the pilot watershed protection program) is in a part of his farm he could easily spare for the purpose. It was steep land—much too steep and broken for cultivation.

The sediment pool behind the dam is stocked with bass, bluegill, bream, and crappie. And, Kubik and his neighbors like to fish.

Water in the sediment pools of floodwater structures has been especially helpful in areas in which rainfall has been below normal.

In the fall of 1954, a floodwater dam was completed on the farm of Glen Aiken in Kansas' Aiken Creek watershed. Since its completion only one rainstorm has produced runoff that

might have been troublesome. It filled the sediment pool of the dam, however.

Since that summer, Mr. Aiken has opened the valve of the structure periodically to keep the waterholes in the creek below filled for use of livestock on his neighbors' farms.

One of the neighbors, Frank Ferguson, said he was able to graze land that would not have been used without the water from the pool on the Aiken place.

Near the northern boundary of Kansas, in the Little Delaware-Mission Creek watershed project, a floodwater-retarding dam was built on the farms of Roy Craig and Fred Gampher. During the building of the dam, a spring was opened and the flow from it now keeps the sediment pool filled to the lip of the drawdown tube, which, in turn, keeps the water level low enough to allow for flood storage.

In 1956, it was an abnormally dry year in that area. The new pool was a lifesaver. The Brown-Atchison Rural Electrification superintendent found a day when his crew was not busy. They built a half mile electric powerline to the site. The Mission Township commissioners installed a pump. Now, many farmers get water from the pool.



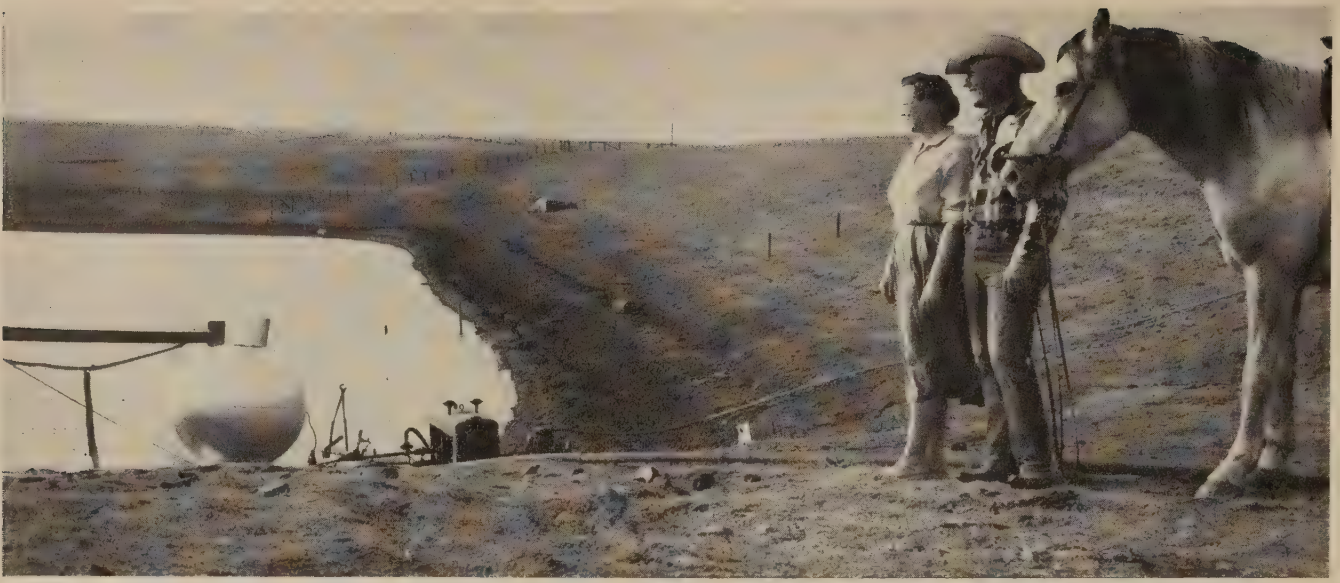
Wooden bridge in the Delaware-Mission Creek watershed, Kansas, that was replaced by an earth fill and 42-inch culvert after a flood detention dam was constructed above.

Craig and Gampher have been developing 6 acres near the site for wildlife. They have planted multiflora rose, honeysuckle, lilacs, chokecherry, and honeylocust.

The county bridge below the dam was replaced in 1956. Because of the floodwater-detaining effect of the dam, the county used only a metal pipe 42 inches in diameter. The



Flood-detention structure in the Salt Creek watershed, Nebraska, soon after a 4-inch rain. No flooding occurred below this structure, while the 18 inch draw-down pipe disposed of excess water over a period of several days.



Mr. and Mrs. E. G. Todd stand near pump and pipeline that supply the town of Ramona, Okla., with water from a Double Creek watershed structure.

bridge it replaced was a steel-girder type with 50 planks on the deck. Brown County engineer, Frank B. Reeves, estimates that bridge repairs and replacements over a 10-year period will be reduced by \$100,000.

And, there's the experience of the community of Ramona, Okla., north of Tulsa. Ramona's water supply failed, but a crisis was avoided when rancher E. G. Todd told the citizens they could have water from the sediment pool of the floodwater dam on his ranch. They installed a pump and line to the community's system. Todd made no charge for the water.

Carrying out upstream-watershed projects is one of the assignments of the Soil Conservation Service. The program has become one of the most important in the Nation's soil and water conservation jobs.

The program really began in 1947, in 11 major watersheds covering 30 million acres. Then, as public interest heightened, Congress, in 1953, appropriated \$5 million to start upstream-watershed improvement and flood-prevention work in 60 pilot watersheds over the Nation.

An objective of the pilot watershed work was to show the benefits from dovetailing soil and water conservation practices and the upstream flood-prevention structures.

In 1954, Congress made it possible for any group of local citizens with watershed problems to solve their problems with Federal help. The

legislation passed at that time is called the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Cong.). It was modified by the 84th Congress (Public Law 1018) to make the scope of its assistance to local organizations much broader.

The Watershed Protection and Flood Prevention Act makes it possible for the local groups to: (1) Ask for Federal help in flood prevention, conservation, use, development and disposal of waters; (2) get Federal, technical, and financial help in the planning and installation of the needed works in watersheds, with the local organizations bearing their proportionate share of the cost; and (3) arrange for long-term loans from the U. S. Department of Agriculture to finance local costs.

The size of such projects is necessarily limited. No single structure may have more than 25,000 acre-feet of capacity, with a limit of 5,000 acre-feet of capacity for strictly flood prevention purposes.

The Watershed Protection and Flood Prevention Act has helped to bridge a wide gap in watershed development between conservation work on individual farms and the large flood-control developments on major streams. It has given the word "watershed" a new meaning—a meaning that bears on the future well-being of our vital soil and water resources.

Songbirds in Living Fences

By JOHN T. LINEHAN

NOT all farmers are interested in increasing the number of game animals on their farms, but most of them would be glad to have more songbirds in the fields and fence rows. Researchers at the Patuxent Research Refuge, in Maryland, while studying the effects of conservation farming on wildlife, decided to test how hedges differ from wire fences in attracting songbirds, and what specific kinds of hedges were best from the bird's point-of-view. The results of this research, conducted on 3.4 miles of hedgerows located on 230 acres of experimental farmland, indicate that modern farming practices can do much to add birdlife to the farm.

The study was a simple one. There were four types of habitat to be observed: (1) mature multiflora rose, 7 years old and 9- to 12-feet high; (2) young multiflora rose, 2 years old and 2- to 4-feet high; (3) barbed wire fencing; and (4) other shrub hedges. Three units of each of these types were selected, each 660-feet long.

Note.—The author is biologist, U. S. Fish and Wildlife Service, Laurel, Md.

The investigators tried to select typical units that could be compared statistically.

Two observers walked abreast on opposite sides of each row and counted all birds seen. Each unit was censused 6 times, with care being taken to count each strip under the same set of conditions. For example, each strip was counted twice between 7:55 and 8:45 a.m., twice between 8:45 and 9:35 a.m., and twice between 9:35 and 10:25 a.m. The observers changed sides and traveled in reverse directions on succeeding days. The censusing was accomplished on 6 fair mornings within a 9-day period in late May 1954.

At this time of year birds are migrating through the area to northern nesting places. Those birds that do not nest in the Patuxent area, and a few which used the hedges only occasionally for perching, were not included in the summary.

The investigators used statistics to determine what differences in their observations might have resulted from chance, and which indicated significant differences in the kind of hedge studied. From this analysis it was learned that differences in the bird populations of the vari-



Multiflora rose hedges on the Patuxent Research Refuge.



Tartarian honeysuckle hedge on the Patuxent Research Refuge.

ous hedges studied were significant. That is, all mature shrub hedges were more attractive to birds than wire fences, either clear cut or bordered by weeds and tall grass. Tartarian honeysuckle attracted the greatest number of birds, but multiflora hedges contained more species. Nesting birds were less numerous in young multiflora than in mature multiflora or other shrub hedges.

A silky dogwood hedge, used to mark a contour line, looks as if it should provide excellent cover for songbirds. This hedge was 6 years old and was tall and thrifty. As compared with the Tartarian honeysuckle, however, it was used but little by birds. The observers concluded that the dogwood did not provide enough low cover, and that it was not bushy enough to satisfy the birds.

Rugosa rose was available in only one hedge and had not made a good growth. The plants were only 2- to 3-feet high. This hedge was of no apparent value to birds, but the observers could not say whether or not a more successful rugosa rose planting would be beneficial to them.

The study showed that hedges were used by a variety of bird species, twenty-three in all. Fifteen species were of shrub-nesting habits and probably nested in the hedge strips. Song sparrows seemed to prefer the multiflora rose; especially the mature strips. Field sparrows preferred the honeysuckle and dogwood over the

multiflora rose.

From this short study, it seems clear that living fences and contour strips serve dual functions. The fences serve to hold livestock in the pasture, and the contour hedges mark the field boundaries along plow lines. However, both kinds of shrubby growth add significantly to the populations of songbirds on the farm. The farmer, in selecting the right planting material, can improve songbirds' environment.

The results suggest that Tartarian honeysuckle could be used to increase the number of birds in living fences or borders by interplantings or additional plantings. Obviously, wire fences are preferable near berry plots where songbirds are a nuisance. None of the bird species using the study hedges normally damage sprouting corn or small grain.

INTERPLANTING IN CORN

(Continued from page 227)

lished. Seed delivered by the other units is firmly pressed into the soil by the press wheels.

Hay yields, from interseeding in corn, have been satisfactory. Even when equipment used did not seed close to the corn row, hay yields have been within 0.2 ton of the production as hay seeded in small grain. Better stands, next to the corn row, result from the use of row straddling equipment, and it is believed that better hay yields will also result from the use of this type of equipment.

Hay fields, resulting from interseeding in corn, are not as smooth as where the hay was seeded in small grain. However, this unevenness of surface has caused very little difficulty as long as the haying operations are performed parallel to the corn rows.

Interseeding in corn provides an excellent rotation for erosion control where combined with plow-plant. The land can be in hay most of the time. The hay is not plowed until the latter part of May. The land is left in a rough-plowed condition until the time of first corn cultivation. Legumes are interseeded early in July, and a good protective cover of legumes is established by the last of July.

Pineapples in Puerto Rico

Soil conservation measures and mechanized operations go hand-in-hand in the pineapple-expansion program of Puerto Rico.

By R. L. VON TREBRA

IN July 1956, the Puerto Rico Land Authority, which owns and operates most of the pineapple-producing land of the Island, began a 5-year program that calls for increasing the pineapple acreage approximately seven or eight thousand acres.

A modern pineapple-processing plant, costing approximately \$4 million, is being constructed 4 miles west of Manati, in the Norte Soil Conservation District, in the heart of the pineapple-producing area. The plant should begin operations in 1957.

The Land Authority and the Norte and Atlantico Soil Conservation Districts, assisted by the Soil Conservation Service, started the planting program with conservation practices as a "policy." During the first 5 months, more than

900 acres were planned, laid out, and planted, using such conservation practices as contour planting, terracing, grass waterways, and water-management controls.

A number of problems had to be overcome before practical and successful conservation planting could be done. For example, pineapple operations are rapidly becoming mechanized. Field operations, such as cultivation and spraying and much of the picking, are done with machinery which cannot operate around sharp turns in contour rows.

Many contour layouts, due to irregular topography, must be modified. The same is true with land that is terraced and contour planted. SCS personnel had to plan and lay out parallel terraces where practical. Land Authority personnel had to see the value and relationship of practices and be trained in terrace construction.

Water disposal and management, involving terraces and waterways, was another problem

Note.—The author is director, Caribbean Area, Soil Conservation Service, San Juan, P. R.



Terraced pineapple field in Puerto Rico. Terrace channels are used as access roads.

complicated by lack of experience with such measures. In general, this lack of experience applied to Soil Conservation Service personnel as well as Land Authority field personnel. Not all fields can be terraced, but most fields usually need bermudagrass waterways whether terraced or only contour planted.

In the Norte district only one large field of 40 acres had been terraced by the end of 1956. More fields would have been terraced, however, if equipment had been available.

In the Atlantico district, 225 acres of new pineapple land were laid out and planted between parallel terraces. In addition, 225 acres were planted in modified contour rows.

In the Norte and Atlantico districts, between 1,700 and 2,000 acres of conservation-planted pineapple lands should be put in during 1957.

"Mechanization" of pineapple production in Puerto Rico, including conservation production methods, is a new but promising venture. Answers to all the problems are not yet available, but they're coming fast. Adjustments in conventional access roads to fit into terrace- and water-disposal systems must be carefully planned. Plans must be made for meeting the problems of picking, machinery operation, and reduced labor and machinery costs. To date, it is evident that the right answers can be worked out. Puerto Rico is now on the way to solving its pineapple-production problems with conservation methods.



Terrace construction in Puerto Rico on land to be planted to pineapples.

DISTRICT PROFILE

CYRIL CRAWFORD
of
MINNESOTA

CYRIL Crawford of Winona, Minn., better known as just plain "Cy" Crawford to hundreds of Minnesota farmers, is one of America's top salesmen for soil conservation. When he delivered the keynote address at the convention of the National Association of Soil Conservation Districts at St. Louis, in February 1957, thousands of other conservationists became acquainted with him.

Minnesota "soil savers" applauded selection of "Cy" Crawford for the national keynote address. Many met him for the first time at Winona, Minn., in 1950, when he handled convention arrangements for the state association.

"Right away we learned he could think on his feet and wasn't afraid to fight for his objectives," says Ted Hegseth of Fergus Falls, a past president of the Minnesota organization. "Cy loves nothing better than a good scrap and he gives a good account of himself. At the same time, Cy understands that the soil conservation movement is one that requires full cooperation by all government agencies. He stresses that theme in his talks wherever he goes."

A dynamic speaker, Cy Crawford is constantly urging district supervisors to serve as "quarterbacks" on the drive against soil depletion.

"The glory in the soil and water conservation program is so great," he assures his listeners, "that there is plenty to go around. However, we must remember that it's up to us as district supervisors to get the job done. We're the boys who must direct the program in our various districts to see that farmers stop losing their topsoil through wind and water erosion."

When Crawford addresses an audience, it's difficult to believe his formal education ended at the eighth grade. A native of Buffalo County, Wis., he was raised on a farm about 10 miles west of Arcadia. He attended a country school near Arcadia but quit school after going as far as he could there.

"That was a mistake," he admits. "When I became an apprentice machinist at Duluth, I took a lot of ribbing from the other fellows. I was a 'country hick' to them and they rubbed it in. I took so much ribbing from them that I finally decided to go to night school. I learned more in 6 weeks at that school than I would have learned in 6 months in high school."

After working less than two years as a machinist, young Crawford decided he wasn't going to be happy in the city. He became a salesman for a feed company at Stillwater, Okla.

"It was the same story there," Crawford admits ruefully. "I could sell feed, but I was handicapped by lack of an education. Finally, I realized that I needed to take special courses in animal nutrition if I was going to keep up with the college-trained men. That meant going to college. Since I lacked high school credits, I had to talk the professors at Oklahoma A. & M. College into letting me sit in on some of their classes whenever I was in Stillwater."

Crawford's big break came in 1933. The J. R. Watkins Co. had established an experimental farm near Winona. A capable man was needed to direct its affairs and Cy Crawford got the job.

From a soil-erosion standpoint, the farm was in poor condition. Whenever a drenching rain fell, the water would race down the sloping rows and carry off untold tons of topsoil. Huge gullies began to form and grow deeper and longer, while soil fertility was greatly depleted.

"Gullying posed a major problem to me as manager of the farm," Crawford says. "I did the best I could—which was practically nothing. The farm looked like a losing proposition to me because there was nobody around to whom I could turn for help."

Then a CCC camp was established in the Gilmore Valley area. The CCC workers began laying out fields on the contour. Crawford went down to see what was being done and decided that contour strips could solve most erosion problems on the experimental farm he was managing.

"I coaxed the technicians in the Gilmore Valley project to come over in their spare time and lay out strips," Crawford recalls. "That was in the fall of 1936. They were the first strips on a Winona County farm and the neighbors got many a laugh from those crooked rows."



Cyril Crawford directing farming operations over the farm's special communications system.

Today—nearly 21 years later—neighbors no longer chuckle over those contour strips. In fact, many of them now have switched over to similar conservation practices.

Crawford took a leading role in establishing the Burns-Homer-Pleasant Soil Conservation District. This was the first one organized in the State.

"This district also has the distinction of being one of the first in the Nation organized on a watershed basis," Crawford emphasizes. "It comprises three natural watersheds. We like to point out that it was achieved long before the small watershed program was established."

After the district was organized, Crawford chose to take a back seat in its affairs.

"I just assumed that every farmer in the area would start asking for technical help," he says. "I knew that practically every farm in the district needed a well-planned conservation program. But, to my surprise, very few farmers took advantage of the technical help."

In the spring of 1948, Crawford became a district supervisor, replacing one of the original members. He became a zealous advocate of the program, urging his neighbors to get rid of the gullies and establish contour strips.

In 1950, when the State convention was held in Winona, Crawford had charge of arrangements for the event. He did such an efficient job that he was elected an area director. Four years later he became president of the State association and served two 1-year terms.

—HAROLD SEVERSON

THE CHURCHES' RELATION TO CONSERVATION

By JAMES W. SELLS

THE future of America depends upon our natural and renewable resources. The pressure of an increasing population makes more important the necessity for a continued study of man's relationship to the land on which he lives.

There must be a continued understanding of the emphasis on the theme, "Man, Land, and God." God gave man life and made the land on which he was to live. Remove any point of this triangle and the whole framework falls. Too long we have looked upon conservation of our soil and water resources as purely an economic responsibility.

We must understand that this is a spiritual matter. We cannot develop Christian character of worth and value without the resources that come from the right use of soil and water. If man is to be anything more than an economic being it must be realized that he has a spiritual value. Whatever happens to the land eventually brings its fruits to or takes its toll from the life of man.

The Church is concerned with the ultimate values of life. The Church is of God and for man; and, therefore, must live off of the land. Poor soil always makes poor people. But, good land only makes possible good people. The Church is consequently concerned about the quality of life, and the quality of soil on which people live and from which our food comes.

Increasingly, churches, both rural and urban, are promoting programs that have to do with the spiritual interpretation and right use of our soil and water resources.

The authority for all of this is to be found in the Bible, because God created man and placed him in a garden and told him to dress it and keep it. God gave man the land and told him "to

have dominion over all things."

The ultimate value of our stewardship of life rests upon our stewardship of our material and renewable resources.

RANGE MEN DISCUSS GREAT PLAINS.—The distinctive character of semiarid country, as contrasted to either arid or humid, is the crux of the Great Plains problem. This was a unifying theme of the tenth annual meeting of the American Society of Range Management at Great Falls, Mont., in January 1957.

The opening session was devoted to "Ranching in the Northern Great Plains". Descriptive and analytical papers on the same subject appeared throughout the 3-day program on research, extension, range-improvement techniques, and economics of rangeland use.

"We must accept semiaridity as a working fact," said Karl Kraenzel, professor of sociology at Montana State College. He emphasized that: The semiarid region is not simply an intermediate transition between humid and arid, but has peculiar characteristics of its own. Successful adjustment to the environment requires that these conditions be recognized.

J. B. Campbell, in charge of the pasture section, Dominion Experimental Farms, Swift Current, Saskatchewan, Can., described some of these peculiar features in his talk: The greatest problem is the variability of rainfall, not the amount, he pointed out. Rivers of the area are troughs that carry snowmelt from the mountains, rather than drainage systems for local precipitation. These and other features set the semiarid plains apart.

Arnold Heerwagen, SCS range conservationist, Denver, Colo., described examples of range sites in the central Great Plains, pointing out great differences in productivity within the same locality. Most of the conservation and management problems come from basing management expectations on potentials characteristic of more humid and less variable climate, he stated.

The meeting attracted the largest attendance in the history of the range society. Out of a membership of slightly more than 3,100 range technicians, administrators, and ranchers, 474 registered. Ranchers comprise about 20 percent of the membership.

—BEN OSBORN

TREE SPRAYING BY AIR.—Several Oregon tree farmers have made profitable use of airplanes in controlling brush in their young fir stands.

Rudy Bauder, tree farmer at Willark, said aerial spraying successfully controlled willows, snow brush, cherry, and other brush species. However, vine maple did not respond to the treatment, he said.

—*The American Tree Farmer*

Note.—The author is executive secretary, Southeastern Jurisdictional Council, The Methodist Church.



THE FUTURE OF ARID LANDS. Gilbert F. White, editor. 453 pp. Illustrated. 1956. Washington: American Association for the Advancement of Science, Publication No. 43. \$6.75

THE International Arid Land Meetings in New Mexico, April 26 to May 4, 1955, brought together scientists and technical workers from 17 widely scattered nations under the sponsorship of the American Association for the Advancement of Science.

Their discussions of arid-land problems were organized around four dominant themes: (1) Variability and predictability of water supply, (2) better use of present resources, (3) prospects for additional water sources, and (4) better adaptation of plants and animals to arid conditions.

The papers presented in the meetings and the recommendations resulting from them are made available in this book.

Along with a great deal of familiar information, and much not so well known, are a number of fresh and stimulating ideas about land use possibilities in lands where water is scarce. In this country, people concerned with the Great Plains program will find this book pertinent to their interests.

There is, for example, penetrating discussion of the possibilities of selecting, breeding, and improving plants and animals for arid conditions rather than concentrating upon adjusting the arid environment for plants and animals imported from humid areas.

A suggestion that arid lands look toward industrial rather than agricultural expansion is supported by one speaker, who states:

"Actually . . . agriculture is a marginal use of water. In the United States the water that will support one worker in arid-land agriculture will support about 60 workers in manufacturing . . .

"Let the humid regions ship food into the arid, since with the arid lands reaching the limit of their water supply, the humid regions can produce more efficiently anyway and have

by no means reached the limits of their capabilities."

These are just two examples of the many viewpoints covered. The whole range of thinking is recorded without attempting to reconcile differences of view or fill obvious gaps. No single, clear answer emerges. But the reader will have his understanding of arid-land problems broadened by thoughtful attention to the symposium papers.

—BEN OSBORN

SOIL CONSERVATION. By J. H. Stallings. 575 pp. Illustrated. 1957. New Jersey: Prentice-Hall, Inc. \$8.50

THE author has drawn on information and research data from about 600 authors to write this book, and he has documented the efforts and accomplishments of the soil and water conservation movement during the past 20 years.

The first 2 chapters deal with the historical phase of erosion and the more recent recognition of the problem since 1930. The remaining 23 chapters are concerned with the fundamental considerations of conservation, practices, and types of conservation farming, as well as farm and watershed planning. In the chapter dealing with how water erodes soils, special emphasis is given to how "raindrop splash" causes soils to move. The 3 types of soil movement; namely, saltation, suspension, and surface creep, are explained in the chapter on wind erosion.

Subjects such as mulch farming for row crops, stubble-mulch tillage, grassland and woodland farming are included, along with general principles of irrigation and water disposal.

Numerous illustrations are included covering a wide range of conditions that show causes, effects, and principles of control measures. Each chapter includes a comprehensive list of references for those who desire additional information on the subject.

The book is written for use in colleges and universities as a text or reference. It is also valuable as a reference for agricultural workers.

—B. D. BLAKELEY

SOIL CONSERVATION STUDY.—All students in the seventh through the twelfth grades of the Bluffton High School in South Carolina, participated in a 2-day study of the various phases of conservation in October 1956. The emphasis was on soil and water conservation. The 2-day course was a cooperative activity between the school, the Beaufort-Jasper Soil Conservation District, and the Soil Conservation Service.

The first day was devoted to classroom work. Various topics were given by specialists using the lecture method supplemented by audio-visual aids.

The second day was spent on a field trip to Cypress Woods Plantation near Ridgeland, where students could observe practices applied to the land.

The teachers of the respective grades attended all discussions and went on the field trip. All teachers highly praised the 2-day study. District supervisor, H. E. McCracken, who is also the school superintendent, was highly pleased with the results.

Students generally were impressed and can now speak some of the "lingo" of a conservationist. Teachers are planning to use the background material, gained by the study, to present a fuller and richer course in the proper care of natural resources.

—RAY E. MCLIN

HELICOPTER USED FOR TREE SPRAYING.—A helicopter was used to spray small woodland tracts in eastern Tennessee in a recent experiment on controlling weed trees.

The chemical used was 204-5-T. The experiment was conducted by a large tree farm in an attempt to develop an economical method whereby tree farmers could remove low-grade hardwoods and free small pine seedlings for rapid growth.

—*The American Tree Farmer*

LAND JUDGING.—The Soil Judging program held in Kentucky for the second year was highly successful. In the 9 FFA District contests 90 teams entered, while 42 teams were entered in the 9 4-H Club District contests. More than 1,400 FFA and 4-H Club boys participated in soil judging activities in 1956. Commercial interests provided \$900 for awards.

SUNFLOWERS FOR PHEASANTS.—Pheasants should have a better chance to survive this winter, thanks to combined efforts of local farmers, the Clay County Soil Conservation District, and the Glydon Rod and Gun Club. During the past 4 years, the club and soil conservation district gave the district's technical staff 200 sacks of sunflower seeds to distribute to farmers. Most of the seeds were planted in rows along the edge of corn fields or along windbreaks. Les Pulkrabek, work unit conservationist, says, "When they're properly planted and cared for, the seeds will be available to pheasants during the winter when other foods are covered by snow."

—*The Conservation Volunteer, Minn.*

FOREST SOIL NOT DEPLETED BY TIMBER HARVESTS.—Forest soil is not depleted by timber removal, according to Dr. Chet Youngberg of the Oregon State College Forestry Soils Department.

"Although an average acre of Douglas fir forest land may yield 450 tons of wood at the time of harvest, less than 1 percent by weight is made up of soil nutrients, including nitrogen and other inorganic compounds," said Dr. Youngberg.

"During the 80 to 100 years required to produce a log crop, this depletion is more than replaced by the weathering of minerals in the soil and by addition of nitrogen by rainfall and the action of nitrogen-fixing organisms in the soil."

—*The American Tree Farmer*

CONSERVATION FELLOWSHIPS.—The Graduate School of Public Administration at Harvard is offering for the academic year 1957-58 eight fellowships for advanced study and research in the field of the renewable natural resources.

The purpose of the fellowships is to provide training in the administration, management, and development of renewable natural resources for men with experience in the field, and a bachelor's, or more advanced, degree.

The staff conducting the school will come from eight university departments giving instruction in this subject.

JUNE 1957



Soil Conservation

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION.

EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C

★ THIS MONTH ★

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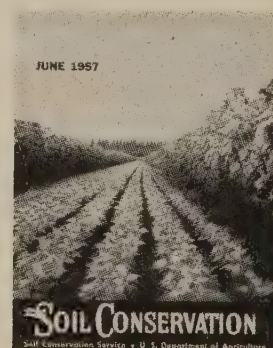


SAFETY RECORD.—During 1956, SCS employees worked almost 29 million man-hours with only 119 disabling accidents. This was a frequency of 4.12 accidents per million man-hours of exposure. More than 10,000 automobiles and trucks were driven about 92 million miles with only 347 accidents. This was a frequency of .38 accidents for each 100,000 miles driven.

STUBBLE MULCHING FOR DRY YEARS.—During dry seasons stubble mulching has shown a definite superiority over plowing and clean cultivation for corn at Lincoln, Nebr. In 3 dry years (1939-41), stubble mulching gave average corn yields of 31.1 bushels per acre, compared to 18.7 bushels for plowing. In 3 wet years (1942-44), however, plowing and clean cultivation was better—73.7 bushels compared to 62.2 bushels for stubble mulching.

—Nebraska Experiment Station Quarterly

Editors are invited to reprint material originating in this magazine.



FRONT COVER.—Single rows of sun-flowers, about 30 feet apart, serve as shelterbelts to protect loose muck soil and young bean plants from severe damage by wind erosion in the Lake Okeechobee area of Florida.

—Photo by Leon J. Sisk

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Operation Wildlife

By DURWOOD E. BALL

A BOMBING and gunnery range is a haven for wildlife, and is also a recreational area as a result of "Operation Wildlife" of the 4004th Air Base Squadron, on Matagorda Island, Tex.

An agreement between the Air Force and the Calhoun-Victoria Soil Conservation District, in 1955, enlisted the technical assistance of the Soil Conservation Service in planning the best land use for the Island consistent with its primary role in Air Force training.

A survey of the 36-mile-long strip of land off the Texas coast revealed a high potential for wildlife production coupled with livestock grazing. Major R. E. Freeman, base commander, launched the wildlife operation for constructive development of the land with a minimum of interference from the necessary bombing and gunnery practice.

The results won the Air Base Squadron a special plaque under the Frank A. Wood Wild-

life Award program for 1955 and, in 1956, the Copano Bay Soil Conservation District presented the squadron with a Lion's Club plaque for outstanding work in the field of wildlife conservation.

With the help of soil conservationists, Major Freeman and Captain Byron Clark, Special Services officer, made a careful inventory of the wildlife on the island and its habitat needs.

The survey showed a great need for protective cover for quail. Resting and roosting cover was especially deficient.

There were a few turkeys on the island, but predators were taking a heavy toll because of lack of roosts, since the island is practically treeless. Migratory birds needed additional fresh water and food.

Deer were plentiful but small in size. The deep, sandy soil of the Island is low in fertility and the forage produced is low in nutritional value.

The survey revealed that a great deal could be done to improve wildlife habitat with little

Note.—The author is work unit conservationist, Soil Conservation Service, Refugio, Tex.



Quail flushed from covert on Matagorda Island.

cost and a lot of work. Accordingly, a conservation plan was prepared. Upon its approval by the Air Force and the soil conservation district, the program was underway.

Although little could be done about the inherent qualities of the soil, the quality of forage could be improved by better range management and fertilization. Good range conservation practices, including proper livestock use, were made a part of grazing leases. The improved range management has benefited the ranchers as well as wildlife.

Grapevines were set out along fence lines to provide cover for quail, while 3,000 salt cedars were planted in 68 small fenced areas. In other places, brush was stacked in tepee fashion leaving open space underneath for the quail. Other coverts were made of discarded bomb crates. More than 200 cover areas were provided. Most of them were promptly occupied by quail—some within a few hours after completion.

Twenty turkey roosts were erected and now are being used by turkeys. Oil drums cut in half were welded to the legs of the roosts to prevent ground predators from molesting the birds. The turkey population has increased since the beginning of the program.

Five areas totaling 220 acres were fenced and planted to ryegrass and oats to provide feed for migratory waterfowl as well as resident wildlife. Some of these areas will be planted later to blue panicum (a perennial grass adapted to island conditions). Deer eat the forage read-

ily; quail and turkey like the seed; and geese browse the roots and tender shoots.

In other areas, the soil was harrowed or disked to encourage growth of annual weeds like croton and sunflower. These areas have provided feed for turkeys, quail, and mourning doves. Twenty-seven fresh-water ponds were created by deepening depressions and building dams. This has insured more and longer-lasting supplies of fresh water for waterfowl.

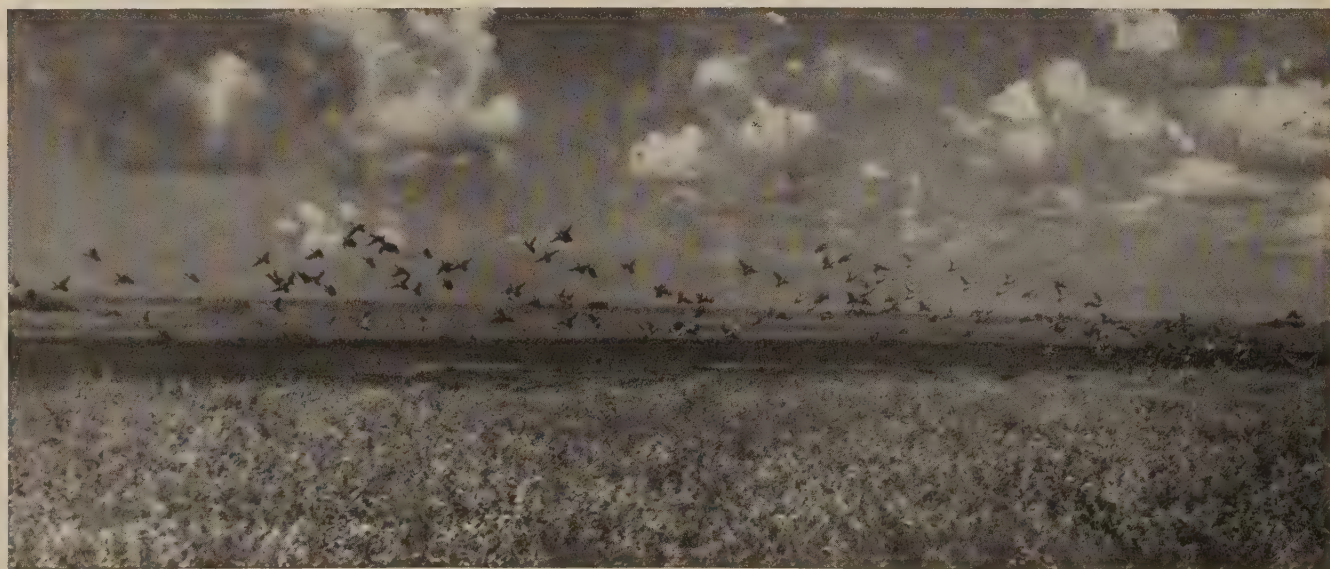
Walkways or dams, built to serve as crash-access roads for the Air Force, have cut off some of the inland swales, thus providing more areas of fresh water.

Trial plantings were made of two salt-tolerant grasses: meadow foxtail and Mediterranean saltgrass. Other trials of multiflora rose and anil indigo were made in an attempt to provide a constant cover and food supply.

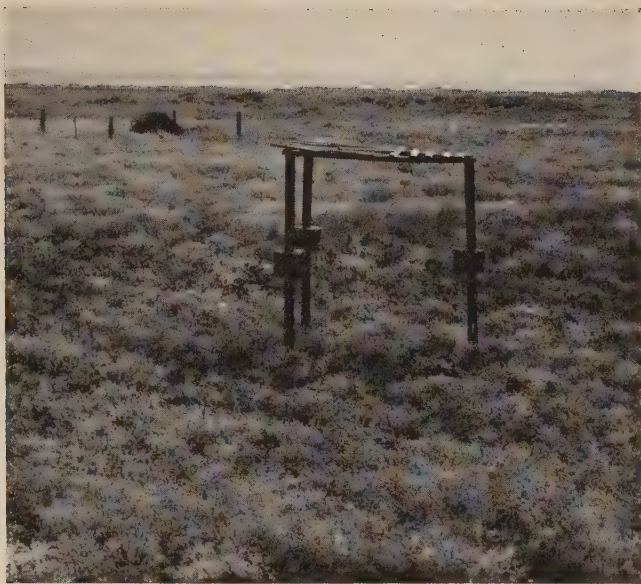
Proper harvest is also a part of the wildlife program. Hunting was a type of recreation that many of the Air Force men had never had the opportunity to enjoy.

Hunting blinds were constructed in the base hobby shop. Fifteen 2-man blinds accommodate 30 hunters. By limiting the amount of hunting, each individual is assured better hunting, and waterfowl have sufficient undisturbed fresh-water areas.

Deer have increased considerably during the past year, a large number of twins being born. An inventory of the deer each year will be the basis for deciding the number to harvest. This



Waterfowl rising from fresh water area on Matagorda Island.



Turkey roost in foreground, quail covert in background on Matagorda Island, Tex.

number will be governed by recommendations of the State Game and Fish Commission.

The installation of two fishing piers, one on the Gulf and one on the bay side of the island, has provided excellent fishing.

Officials of the Texas Game and Fish Commission, the U. S. Fish and Wildlife Service, the Aransas National Wildlife Refuge, and the Soil Conservation Service have been consulted throughout the planning and application of this program.

THE NARAHARAS OF HAWAII

Iwao Narahara, a director of the South Oahu Soil Conservation District, believes in his soil conservation program. Lettuce planted across the slope in small plots and parsley planted on the contour keep soil losses to a minimum even when heavy rains come.

In 1947, a heavy, flooding rain hit his lettuce field just after it had been plowed. "Loose soil flowed off the field and down the drain like so much mush," Mr. Narahara said.

Soon after that, he heard about the Soil Conservation Service and its technical assistance to farmers through Soil Conservation Districts. In 1952, the South Oahu Soil Conservation District was organized and his farm was one of the first to get help.

The lettuce field is now plowed in small plots, with a diversion ditch made above each plot before it is plowed. "I won't leave it plowed for one night without protection from overflow water," Iwao says.

All hillsides are planted in panicum grass so no erosion takes place. The parsley is planted on the contour where little if any soil ever leaves the field.

High producing, first-quality lettuce is harvested every day and goes to market during the night. Parsley is harvested every other day.

For diversification, a brother, Robert, has two greenhouses pouring out Anthurium blooms weekly for the Mainland market. In addition, a few thousand Bird-Of-Paradise blooms are cut from the soil-holding plants growing all around the rim of this high-producing ridgetop farm.

Director Narahara's father, Ginsaku, came to the Islands and settled on this piece of land 50 years ago, rented some additional land, and established a home where he raised 5 boys.

When World War II came along, it became necessary that either the land be bought or the Naraharas move. Iwao, the eldest son, bought the land. Shortly after the close of the war, intensive cultivation of the home place was started. Robert, second eldest, and the twins, Harold and Herbert, work along with Iwao and father Ginsaku.



The Narahara brothers in one of their lettuce fields. (left to right) Iwao, Robert, Harold, and Herbert.

Last summer Dad and Mother made a 6-month trip to the old home community in Japan.

Walter Narahara, third son, is at the University of Missouri studying food processing and handling.

As SCD Director Harahara says, "Land must be protected and managed if we expect to produce the food needed in Hawaii. We have only started; continued study will bring us much help. Our Soil Conservation District's way of doing the job has great possibilities."

—A. W. EMERSON

Hydraulic Research

The Supervisor of the Outdoor Hydraulic Laboratory Discusses Some of the Studies That Are Aiding Conservation Engineers in Solving Water Control Problems.

No. 24

This is the twenty fourth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By W. O. REE

THE early conservation engineer was a pioneer. He ventured into a new field of engineering with little or no precedent to guide him.

He was called on to build structures for soil and water conservation that differed considerably from anything he had built before. The conditions of size, cost, construction method, and materials used were outside the range of his previous experience. Yet, he knew that the basic principles of engineering would apply. What he needed in order to proceed with confidence was information on some of the untried conditions.

An example will illustrate this. Consider the design and construction of a channel to collect the water from a system of terraces and carry it safely downhill.

First, the quantity of water the channel may carry must be determined. Observations of actual runoff from similar areas are needed to arrive at the answer. Such observations together with studies of the effect of various factors, such as rainfall and land characteristics on runoff, belong in the field of hydrology, and will not be discussed in detail here. Past and current research in this field is providing some of the much-needed data.

Second, the size of the channel must be determined. This will depend on the quantity of water it must carry and on the speed with which the water will flow. This gets us into the field of hydraulics.

The speed will depend mainly on the steepness of the channel, the roughness of the channel surface, and the depth of flow.

The steepness of the channel can be measured readily. The depth of flow can be selected. The roughness of the channel surface, however, must be estimated. Such estimates are based on determinations made with flowing water in similar channels. The roughness of some of the materials considered for channel linings had not yet been evaluated and was not much better than a guess for our early engineer.

Third, the material used to line the channel must be selected. This lining must withstand the erosive force of the flowing water and protect the channel from damage. The speed of flowing water that can be permitted before the lining is damaged must be determined by experiments.

Our early engineer could have solved this problem by selecting a concrete channel lining, the performance of which was known. However, the concrete channel seemed unduly costly when compared with possible alternatives.

One of the alternatives was a grass lining that could be grown by the farmer. However, neither the roughness nor protective ability of grass as a channel lining had been precisely evaluated. Therefore, the engineer was reluctant to rely on grass to protect his channel until its performance could be predicted with some degree of certainty.

The great promise that grass seemed to offer as a channel lining made research, on its hydraulic properties, an early and urgent item on the research program. Some of this work has been done, and today the engineer can design

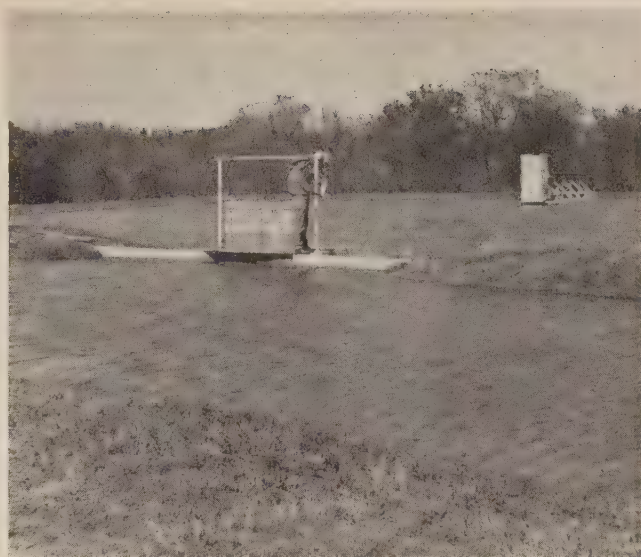
Note.—The author is project supervisor, watershed hydrology section, soil and water conservation branch, Agricultural Research Service, Stillwater, Okla.

and build grass-lined channels with greater confidence than ever before.

Research on the hydraulic properties of grass-lined waterways was first conducted at Spartanburg, S. C. This laboratory was replaced in 1941 by the Outdoor Hydraulic Laboratory at Stillwater, Okla., which is a joint research project of the Agricultural Research Service and the Oklahoma Agricultural Experiment Station.

Among hydraulic laboratories this project is unique. Ordinarily, hydraulic laboratories experiment with small models of the structure under investigation; but research on grass-lined channels requires that grasses tested be grown under natural conditions. The experimental channels must, therefore, be built to full scale. Large amounts of water are needed to produce the test-flood flows in these large channels. Furthermore, the test flows must be controlled in rate and duration and must be accurately measured. The Stillwater Outdoor Hydraulic Laboratory was designed to meet these requirements.

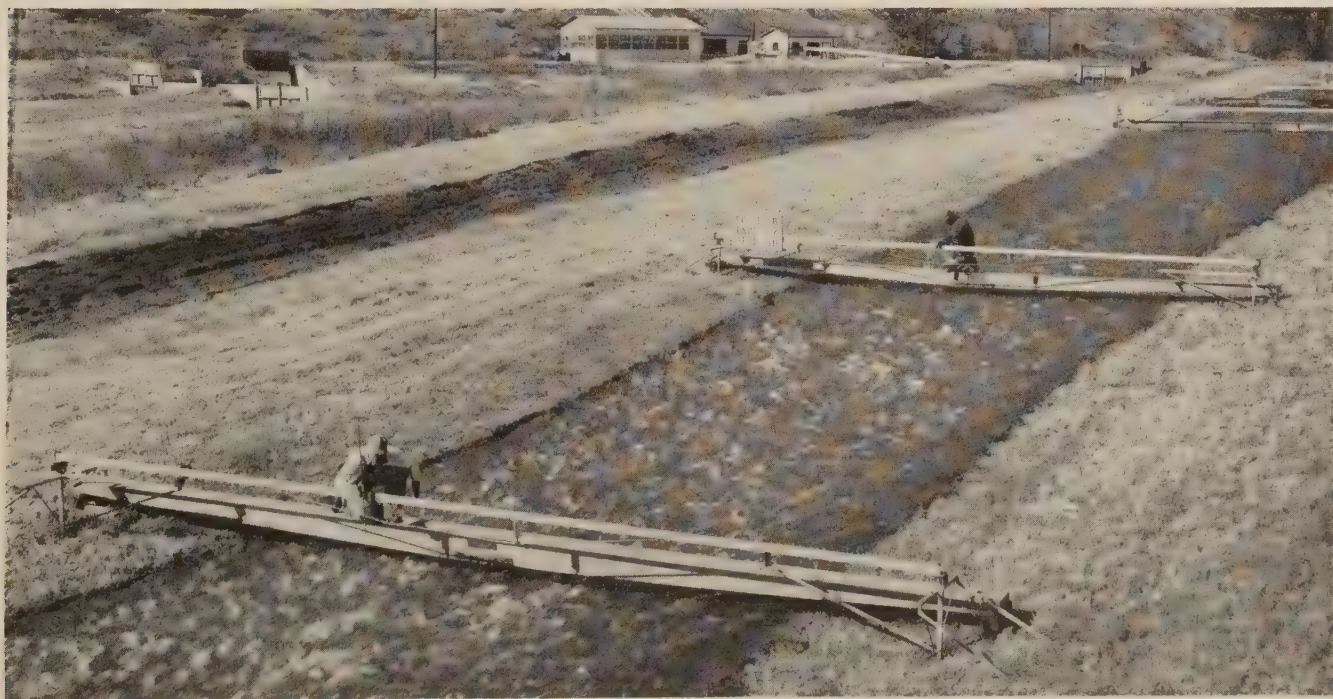
A large area of sloping land is available on which these experimental channels and structures can be built. The water for the testing is drawn from an adjoining lake through siphon outlets controlled by gate valves. Steady flows



The main supply canal in the foreground delivers water to the test pool of the outdoor hydraulic laboratory.

can be maintained that range from a trickle to 175 cubic feet per second, supplied through a large canal nearly a half mile long. The test structures lie downslope from the supply canal. A system of gates permits the quick diversion of water into or out of any of the experiments. Weirs and flumes are used to measure the rates of flow.

In addition to research on grass-lined terrace-outlet channels, the hydraulic laboratory has



Measuring the depth of flow in a bermudagrass-lined waterway at the Outdoor Hydraulic Laboratory.

worked on other soil- and water-conservation structures. The problems with these have been similar to those encountered in channel design and construction.

In determining hydraulic properties of grass-lined channels, the observers measure the depth of flow of a given amount of water at the selected stations, from which the hydraulic roughness of the channel lining may be calculated. Grasses having different heights, densities, and physical characteristics have different hydraulic roughnesses. Therefore, each physically different grass species must be tested in order to cover the range of conditions met in the field. Some of the grasses tested are bermudagrass, weeping lovegrass, King Ranch bluestem, split-beard bluestem, switchgrass, tall fescue, sudangrass, and native grass mixtures.

It was learned that the hydraulic roughness of a particular grass cover will vary with the depth and speed of the flow. This made the calculation of flow velocities in grass-lined waterways very difficult. However, a simple design method was devised which is described in a handbook¹ prepared by the laboratory.

The protective ability of a grass was determined by noting the soil and plant removal that occurred for different speeds of flow. In this

¹ Handbook of Channel Design for Soil and Water Conservation, USDA, Soil Conservation Service, SCS-TP-61, Washington, D. C., June 1954.



Velocity measurements being made in test channel with a concrete gutter down the center.



Test flow in a concrete trickle channel with bermudagrass along the sides.

way permissible flow velocities were determined for the various grasses.

It was found that sod grasses, such as bermudagrass, had the highest permissible velocities and gave the greatest protection. Very clumpy bunch grasses, such as weeping lovegrass, had the lowest safe speeds. This does not mean that bunch grasses cannot be used as channel linings. It does mean, that if used, the channel must be designed so the water will flow at slow speeds. This is done by making the channel very wide so the flows will be shallow. Values of safe flow speeds for various grasses and soils combinations are given in the handbook.

Under some conditions grass waterways are weakened by low flows of long duration. Snow-melt runoff extending over a period of weeks is an example. One solution to this problem has been the use of a small hard-surfaced gutter down the center of the grassed waterway. The grassed overflow portion provides capacity for flood flows. This arrangement is less expensive than paving the entire channel surface, but the durability of the gutter's edge during a flood flow was in doubt.

The hydraulic laboratory, therefore, tested a combination channel using two pitot tubes to measure the speed of the flow. From these tests it was learned that a heavy turf overgrowing the gutter's edge gave sufficient protection. Questions on how to calculate and predict the capacity of such combination channels were also answered by the tests.

A chute structure was needed at the laboratory to return the waste water from the experiments to the nearby creek. To guard against excessive scour, a Saint Anthony Falls stilling basin, developed by Fred W. Blaisdell at the University of Minnesota, was placed at the chute outlet. The full-sized structure at Stillwater provided an opportunity to verify the results of the model studies under field conditions. These tests confirmed the predictions based on the model studies and gave the engineer added confidence in the efficiency of this stilling basin.

Conservation measures on certain lands of slight slope call for widely-spaced terraces of considerable length and channel capacity. Their size must be carefully considered in order to avoid excessive cost. The flow-retarding properties of various crops grown in terrace channels were determined accurately in 2 large channels, 600 feet long and 20 feet wide, built for this purpose. The crops were row-planted with the row direction parallel to the terrace and to the direction of the flow. At maximum growth, a flow of water was turned into the channel. The hydraulic elements were measured and the flow-retarding properties of the vegetation evaluated.

In these large terrace channels, the crop is seldom fully submerged by the flow, and surface roughness does not seem to be a satisfactory term to describe the property of flow retardance. Conservation engineers may write



Returning water to the creek after it has been used for hydraulic tests.



Water flow leaving a terrace test channel that is planted to Redlan kafir.

the author for results on the following crops: Hegari, 40 inch rows; Hegari, 20 inch rows; Redlan kafir, 40 inch rows; cotton, 40 inch rows; wheat, 7 inch rows; wheat, 14 inch rows; wheat, 7 inch rows transverse; and sudangrass, broadcast seeding.

Agricultural flood-prevention measures include detention reservoirs to hold back the flood flows intercepted by dams. This water may then be released from reservoirs through a pipe spillway. Many hydraulic problems are associated with the design of a pipe spillway. These concern not only the capacity of the pipe but the stability of the structure.

Answers to some of the questions were again sought at the hydraulic laboratory. A full-size replica of a typical pipe-outlet spillway was built on the laboratory grounds. It consisted of an entrance structure, a 24-inch diameter concrete pipe through the dam, a corrugated pipe elbow, and then a section of 24-inch corrugated pipe. The tests are being made to determine pipe friction-factor values, entrance-loss and elbow-loss coefficients, vibration factors, and effects of vortex action.

STUBBLE MULCHING FOR WHEAT YIELDS.—At the North Platte, Nebr. experiment station wheat yields averaged 27.4 bushels per acre for a stubble mulch system of summer fallow from 1950 to 1955. This compared with 24.8 bushels per acre where plowing and clean fallow was practiced.

—*Nebraska Experiment Station Quarterly*

Sanors' Woods

A Well-managed Woodlot in Ohio Has Been Producing \$15 Net Income Per Acre for 26 Years and Is Getting Better Year by Year.

By JOHN AUGHANBAUGH

ONE of eastern Ohio's outstanding farm woods is owned by the L. E. Sanor family in Columbiana County. More than 70 years ago the elder Sanor fenced a 20-acre woodland field to exclude livestock. Ever since, it has been carefully managed by father, son, and grandson, and is now an excellent sugar bush and sawtimber stand.

Records kept by the Sanors for 26 years show that the woodlot has yielded an annual net return per acre of \$10 from wood products and \$5 from maple syrup. These earnings were due to the Sanors' good methods of cutting, using, and marketing their forest products. Their

woodland produces, as it should, its proportionate share of the farm income.

Since 1946, a continuous inventory of sample plots made by the Ohio Agricultural Experiment Station has given an accurate yield record. Through sound management practices, including annual marking of trees for cutting, a good stand of high-quality trees is being built up.

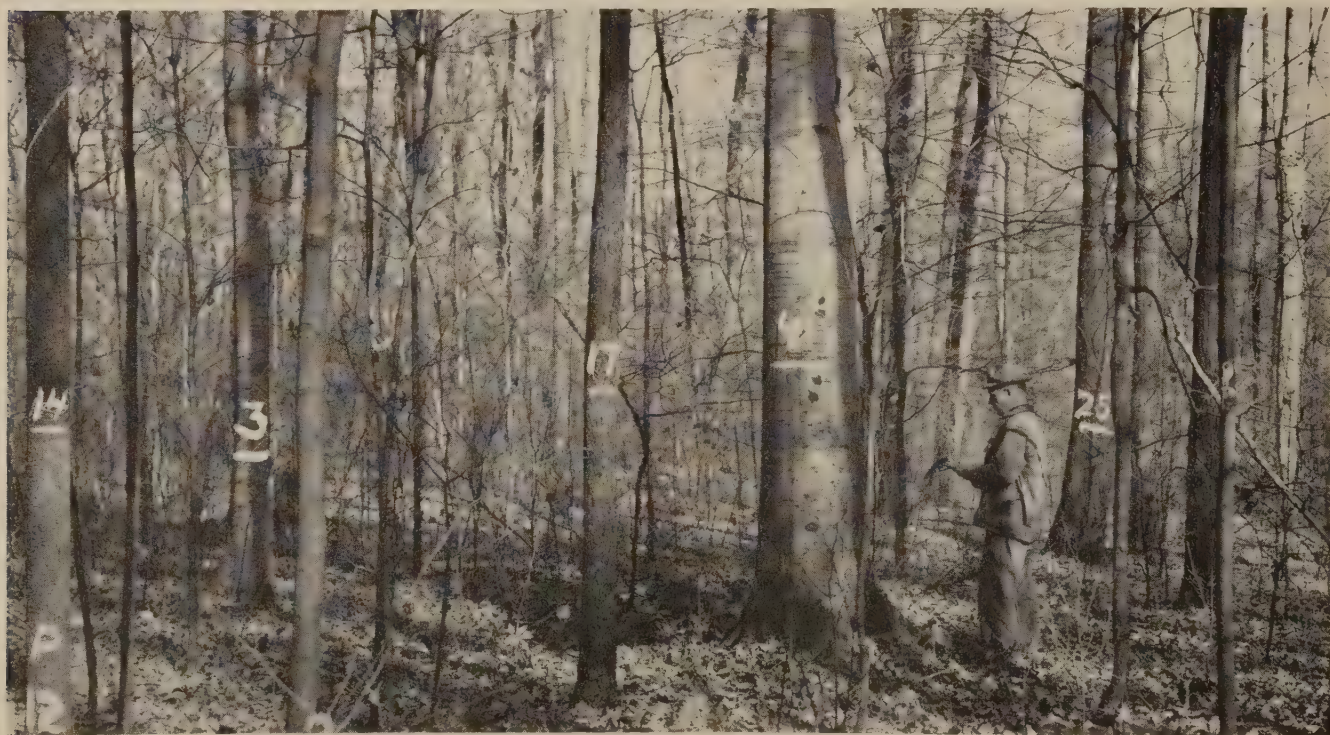
Sanors' woods include sugar maple, beech, elm, basswood, tuliptree, red maple, and red oak. It is mainly a beech-maple stand, of all ages, from seedlings to sawlog trees. The soils on which the trees are growing are fairly good for wood production. Last year's inventory showed 7,525 net board feet to the acre. When fully stocked each acre should support 10,000 board feet.

The Sanors' program of light and frequent cutting permits young trees to grow and insures a profitable return from the same tract continuously. In other words, it is on a sustained-yield basis.

Since 1931, more than 120,000 board feet of timber came off this 20-acre woodlot. From 1946 to 1956, the yearly harvest per acre was 293 board feet—well below the net growth of 318 board feet.

Single trees, not always the largest, have

Note.—The author is research specialist, Department of Forestry, Ohio Agricultural Experiment Station, Wooster, Ohio.



Marking trees for selective cutting in Sanor's Woods.

been cut selectively with a view both to markets and to future crops. The Sanors never hesitate to cut a tree in order to favor another of more potential value. Of the large trees, only the most vigorous ones, which are increasing rapidly in value, have been retained. The result is a larger, more frequent, and more profitable harvest.

These progressive farmers have always done their own woods work, and have used or sold all trees cut. They not only have earned more money but also have left their woods in better shape by selling sawlogs instead of standing trees. They increase their total farm-labor income considerably by doing most of the woods work during off seasons. Also, they make more efficient use of the power and equipment on the farm by their off-season operations.

The Sanors cut each felled tree into the highest quality products for which a market is ready or can be found. Their best logs go to specialty

buyers, often for basket veneer. Lower grades of timber supply the farm with building material, fence posts, and fuel wood.

Unused tops never clutter the ground in Sanors' woods. An average of 2 cords of fuel wood per thousand board-feet cut has come from topwood, defective trees, and thinnings. It is buzzed into firewood for the two farm homes, the sugaring operations, and for sale locally.

The know-how of growing wood crops underlies the Sanors' success. They know trees: how they grow, how to use them, and how to sell them.

Farming their woodland has a challenging appeal to the Sanors, for it is a profitable part of their farm business. They exercise the same energy and foresight in handling their wood crops as they do for corn, wheat, or other cultivated crops. They know that it pays.



CONTRACTORS SCHOOL—Tom Browne, SCS area conservationist at Statesboro, Ga., found that some soil conservation district cooperators in his area were not getting their Agricultural Conservation Program cost-sharing payments for engineering structures that failed to meet specifications. Many of these structures were built by contractors who simply did not understand the specifications. So, Browne invited a group of contractors to his office to give them a briefing on the new ACP specifications for dams and other structures. Five local contractors attended the meeting. They are seen above during a blackboard discussion with John Jackson, SCS engineer at Statesboro. The contractors are: (left to right) Bill Bradley, Hogan, Ga.; John R. Rushing, Statesboro, Ga.; C. F. Degenhardt, Millen, Ga.; W. D. Sands, Daisey, Ga.; and J. W. Arnsdorff, Springfield, Ga.

Pleasant Creek Is Again Pleasant

Inhabitants of the Valley Are Happy as Protection Work on a "Pilot" Watershed in Utah Nears Completion.

By HERB BODDY

WHEN the Mormon pioneers set up their townsite of Mt. Pleasant, along the banks of Pleasant Creek, in 1859, they were tipped off to floods by friendly Ute Indians. Watch out for "flash" floods, the Indians warned. But "bad medicine", or not, floods seemed a long way off to the settlers.

In the seventies and eighties the watershed's good grass was the feeding ground for cattle. Then came the sheepmen who grazed their herds on the green hillsides. After a time, the virgin grass thinned out. More and more bald spots showed on the steep slopes. Then came the severe drought of the early nineties that further depleted the grass.

From those days on the character of Pleasant Creek changed. Instead of a steady, yearly flow it has had a heavy spring flow and intermittent torrential summer flows. Settlers couldn't divert floodwaters for irrigation and there was little water on hand when it was needed. Irrigation systems and cropland were among the first to feel the impact of the new streamflow.

Upstream, on the watershed, and downstream things were happening. Well-stabilized stream beds became raw channels. Sheet and gully erosion cut into watershed slopes. Range feed thinned out. Soon, stockmen reduced their herds—some sold out.

It became clear to settlers and townspeople that without a good grass cover, to slow down runoff and store up raindrops, their watershed offered few safeguards.

With little advance warning, a cloudburst hit the community in June 1918. Most folks figured they were lucky to get off so easy—one life lost

and property losses of \$100,000. Three weeks later, a second devastating flood piled up more damage. In time, people got the debris cleared away.

Nearly 30 years passed before another "crusher" swept down from the deep Wasatch canyons. On July 24, 1946, floods were far from the minds of the people. They gathered in Mt. Pleasant to commemorate the settlement of Salt Lake Valley under leadership of Brigham Young. It was a warm, sunny day. Streets were brightly decorated and flags and bunting waved in a light breeze.

But, Mother Nature had other plans that day. In the afternoon, while farmers and townspeople watched a baseball game, thunderclaps



Contour furrowing and revegetation

Note.—The author is information specialist, Soil Conservation Service, Berkeley, Calif.



Flood damage from the 1946 flood on Pleasant Creek.

echoed over the Valley. Black storm clouds settling over the watershed soon unloosed a down-pour, and one of the town's worst floods was on the way.

By 4:30 p.m., the time the gala parade was to begin, Pleasant Creek became a raging torrent, pouring mud, boulders and debris on farmlands and streets. Damage to business houses, utilities, homes, and farm properties ran well over \$100,000.

When a flood party checked the damaged

area, they found that flood control barriers, erected over the years, contained a huge deposit of rocks and other flood debris. Heavy debris never got over the spread-basin spillway. The deposits in the town came mainly from the clogged stream channel and raw creek banks.

That flood started local people to thinking and planning.

They took a big stride in making their watershed safe when the Sanpete Soil Conservation District took over sponsorship of the 21,000-acre watershed project 3 years ago. Their project became one of 58 "Pilot" small-watershed projects for which Congress appropriated flood-matching funds.

Soon the watershed project became more and more a community enterprise as local groups and organizations volunteered help of various kinds. The Sanpete District Board welcomed these supporting organizations as co-sponsors. Organized as the Pleasant Creek Watershed Protection Committee, the co-sponsors worked as a steering group to see the watershed work through. The committee included representatives of Sanpete Soil Conservation District; Mt. Pleasant City Corporation, Sanpete County; Pleasant Creek Irrigation Co.; Pleasant Creek Highland Irrigation Co.; Coal Fork Irrigation Co.; farmers and ranchers within the watershed; Denver and Rio Grande Western Railway Co.; Utah Agricultural Extension Service; Agricultural Conservation Program Service; Utah State Highway Commission; Utah State



Work in Pleasant Creek watershed.



Eroded hillside on Pleasant Creek watershed before land-treatment measures were installed.

Fish & Game Department; Utah State engineer; Forest Service; and Soil Conservation Service.

The watershed protection program, now nearly completed, is a combination of soil- and water-saving practices plus a system of flood-preventing structures. Cost of the works will total more than \$400,000, half of which will be shared by private and non-Federal interests and the rest by SCS and FS.

The best way to view flood-protection measures installed over the watershed is from the air. Next best, is to take one of the tours conducted off and on during the year by the water-

shed committee. Several hundred people have toured the project so far.

On the way to the upper watershed you will pass several thousand acres covered with rock and other flood debris that was once good cropland. You are told that this land turned out bumper yields around 1900. Homesteaders left the lands when the floods became too frequent. Now the lands are marginal, providing only light, spring grazing.

At the mouth of the canyon, below the confluence of the South, North, and Straight Forks of Pleasant Creek, is a large, 50-acre spreading or debris basin, diked up at the end overlooking the town. You learn the dike has been raised several times in the last 20 years. SCS engineers Bob Rollison and Gordon Hansen, can point out the "splitters" and "spreaders." These large rock buffers have the job of stopping mud-rock from going over the spillway and on downstream.

Silt and debris from future storms will be screened and stored in this basin, leaving only muddy water to flow on. Cleaning, deepening, and widening of the stream channel is next in order before the creek can carry a full flood flow.

In the upper reaches of the watershed, which includes lands of the Manti-LaSal National Forest, the Forest Service has taken steps to slow runoff and improve grass cover.

Some of the steepest and most eroded slopes were contoured, terraced, and reseeded, thus speeding up Nature's mending job. The contour



Debris basin dike in the upper Pleasant Creek watershed.

trenches break up the gully system, prevent erosion, and slow down runoff, thus reducing peak flood flows.

To round out the project, farmers and ranchers—cooperators of the district—are doing their share by carrying out soil- and water-saving practices on their acreages.

Dave Jorgensen, city councilman and chairman of the joint watershed committee, is enthusiastic about the watershed's development.

"I think we've got things about licked now," he said recently. "The amazing thing about this project, as I see it, is that it is a team job, set up and managed by the people themselves. Lots



"Splitter" designed to spread flood flows in upper debris basin of Pleasant Creek.

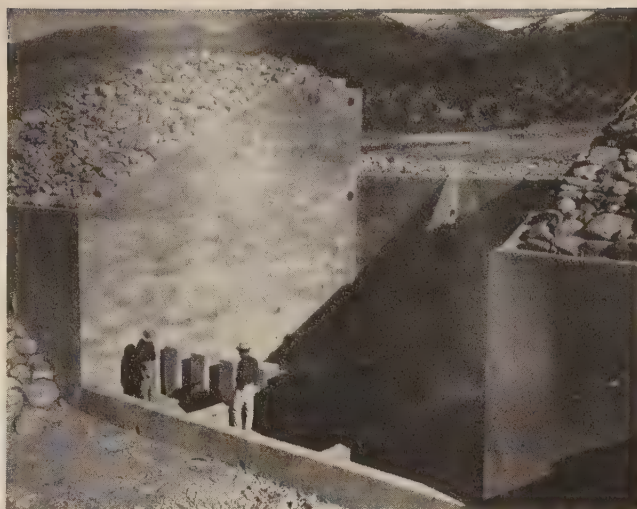
of people pitched in to help make the plan click. One thing is sure, we would have had a mighty tough time of it without the people's help and the assistance of such agencies as SCS and FS.

"You know we got a real scare only a year ago when a midsummer cloudburst sneaked up on us. Our watershed project was only about 25 percent completed then, but the spreaders and splitters piled up debris and boulders just as we hoped they would.

"When debris reached the upper-spreading dam it slowed down. And when that mass of debris stopped, it set off a chain reaction. A pile of rock 5 to 8 feet deep jammed the channel for nearly a half mile upstream.

"At the same time, although only partly completed, the special-purpose terraces, seedings, and gully plugs in the upper reaches, were at work too. They helped keep water on the land where it fell."

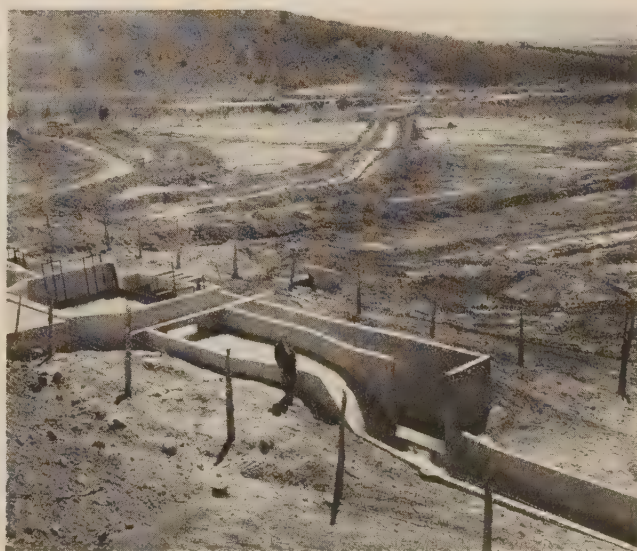
And Mayor Grant Johansen of Mt. Pleasant, says, "Our watershed project will conserve soil and water and protect us from damaging floods.



Emergency spillway of a floodwater retarding and debris-collecting dam on upper Pleasant Creek.

Our people feel safer now that the watershed work is nearly done."

You would think the Sanpete District Board would take things easier now that the Pleasant Creek project is about set. Instead, it begins to look more and more as if the board's activities in watershed-protection work are just beginning. Board chairman, Elden Westenskow, explains that the district already has received requests to sponsor watershed programs at Fairview, where Birch Creek has been kicking up, and on Tids Canyon, at Ft. Green, Chester, and Spring City.



Outlet and diversion structure from upper debris basin that divides water 16 ways for irrigation ditches.

A Year of Progress

PROBABLY the most significant development in the program of the Soil Conservation Service the past few years has been the enlarged scope of its activities. As more and more individuals have come to realize that their conservation problems, especially their water problems, could not be solved effectively through individual action they have sought to solve them through community action.

Prior to the 1950's, the main emphasis of the Service's program was on the planning and execution of coordinated conservation programs for individual farm and ranch units. That emphasis has been enlarged in recent years to encompass programs for entire watersheds or other problem areas. This does not mean taking a new approach to the problem: It means, rather, that the emphasis has been broadened.

The same principles of proper land use and soil and water management are as valid now as they were 10 or 20 years ago. These principles are still the guiding influence toward accomplishment of all Service objectives, whether on individual farms or ranches or on watersheds or problem areas.

The watershed or community approach is not new. The first demonstration projects of the Service were established mainly on a watershed or problem-area basis more than 20 years ago. But the recent trend indicates that more and more communities are now requesting and receiving aid on community or watershed problems. In addition, individual farmers and ranchers are requesting and receiving aid on a wider variety of soil- and water-management problems.

When the Service was first established, its main effort was to aid farmers and ranchers in controlling soil erosion and conserving the water that fell on their fields and pastures. This program was broadened to include soil improvement and soil building. Improved irrigation and drainage methods were added, at the direc-

tion of Congress, as essential parts of the conservation program. Flood prevention through upstream engineering structures was added. Management of land and water for wildlife also became important.

And, through all this development, the problem of using land to fit its capabilities—the conversion of less productive land to grass or woods, and the shifting of high-quality lands from grass or woods to cropland—was of paramount importance to the efficiency of agriculture.

In the meantime, another problem of land conversion confronted us—the urbanization of productive farmlands. During the past decade the urbanization movement has consumed—in suburban homesites, highways, airports, factories, military installations, and other urban developments—more than twice as much productive farmland as has erosion and all other forms of soil depletion brought about through improper farming and grazing methods.

Also, through the past few years there has been the problem of farm surpluses. American farmers and ranchers with their modern equipment and soil improvement practices were producing more than was needed by the Nation. Yet, droughts and floods continue to plague us. The problems become more complicated year by year. And the obligations of the Service become more extensive and complicated each year.

By the end of 1956 the Service was administering or cooperating in 10 different programs. These included: The national soil survey; assistance to soil conservation districts and their cooperators on a wide variety of conservation problems; flood prevention activities on 11 authorized watersheds; watershed treatment on 58 pilot watersheds; watershed protection on numerous other small watersheds under provisions of Public Law 566; the long-range Great Plains Conservation Program; and providing technical assistance on the Rural Development Program, the Agricultural Conservation Program, the Soil Bank Program, and the

Note.—This article is excerpted from a report of the Administrator of the Soil Conservation Service to the Secretary of Agriculture. Statistics are for calendar year, 1956.

Conservation Loan Program administered by the Farmers Home Administration.

Most of these programs require a high degree of local leadership for successful and efficient development and execution. The Service has received gratifying cooperation from many types of local organizations including County ASC Committees, farmers' organizations, civic clubs, specially organized watershed associations, and numerous other groups. In most communities, however, soil conservation districts have furnished a great deal of the local initiative and leadership needed for development of the various projects.

SOIL CONSERVATION DISTRICTS

Farmers and ranchers organized 66 new soil conservation districts during 1956. New districts and additions to old districts covered about 58 million acres. This made a total of 2,744 soil conservation and other conservation districts covering about 1,565,000,000 acres in the United States and Territories. About 91 percent of all farms and ranches and more than 87 percent of all farmland of the Nation are now included in locally organized and locally administered districts.

The Soil Conservation Service signed supplemental memorandums of understanding with 48 newly organized districts during the year. At the end of 1956, the Department and SCS were assisting 2,725 districts. Cooperating with those districts were more than 1,686,000 farmers and ranchers operating more than 500 million acres. The districts reported 123,942 new co-operators with nearly 40 million acres of land during 1956.

SOIL SURVEYS

Soil surveys suitable for farm planning were completed on more than 33 million acres during 1956, an increase of nearly 10 percent over the previous year. In addition, range site surveys were completed on more than 12 million acres. At the end of the year surveys suitable for farm and ranch planning had been completed on more than 527 million acres.

Work plans for converting other surveys to standard soil surveys were completed for 307 areas. Most of the surveys are now being mapped on a progressive or block basis to gain more uniformity in the mapping and increase the efficiency of survey parties.

Considerable progress was made last year in conversion of mapping legends to meet requirements for standard soil surveys. Work on the comprehensive scheme of soil classification was continued. Progress was made in the selection of key soils on which full soil interpretations will be made. Emphasis is being placed on relating kinds of soil to kinds and amounts of vegetation (wood crops and range) that can be grown.

Sixteen soil survey reports with accompanying maps were published. A study was started on small-scale soil

maps, including problem area maps, for counties and States of the United States.

Cooperative studies on the relations of soils to the nutritive value of feeds they produce were continued with emphasis concentrated on the cobalt and molybdenum content.

Considerable progress was made in obtaining aerial photography for areas where existing coverage had become obsolete due to cultural or land-use changes. Ten aerial survey contracts involving 50 areas with more than 20 million acres were active during the year.

FARM AND RANCH PLANNING

The Service assisted more than one million farmers and ranchers in planning or applying some parts of their conservation programs during 1956. Basic conservation plans were developed with 90,572 farmers and ranchers whose lands covered more than 27 million acres. Basic plans were revised on another 10,000 farms and ranches that included more than 4 million acres. At the end of the year 1,138,833 active cooperators with soil conservation districts had basic conservation plans on about 318 million acres.

Service personnel in 1956 provided technical assistance in planning and laying out 2,400 group drainage jobs and 929 group irrigation projects that affected more than 4 million acres.

During the past 5 years more than 1½ million acres were converted each year from cultivated crops to grass and trees on farms and ranches serviced by SCS. Partially offsetting the conversion of cropland to other uses is the conversion of about one-half million acres of certain lands to cultivated crops each year. Thus, the net reduction in cropland through long-term conversion averages about one million acres per year.

Progress was made in improving the quality as well as the quantity of farm and ranch plans in most districts. A wider use of the progressive planning system was responsible for some of the improvement. Also, better "follow up" in assistance to cooperators and revisions of technical guides helped.

CONSERVATION APPLIED TO THE LAND

Weighted averages indicate that about 5.5 percent more conservation work was applied to the land by soil conservation district cooperators in 1956 than in 1955. This progress was made in spite of the continuing squeeze between declining farm prices and rising costs of production and seriously curtailed conservation activities in some communities because of drouth.

Progress in soil conservation is not necessarily measured by the extent to which individual conservation practices are used. A basic conservation program must be predicated on the supposition that all land will be used within its capabilities and treated according to its needs. However, conservation farming is done mainly by land-use adjustments and by applying the various conservation practices needed to each tract of land. Hence, progress may be determined, to some extent, by measuring the amounts of certain important practices that have been applied to the land.

The following table summarizes the application of some of the most commonly used conservation practices for the Nation as a whole.

Newly applied conservation practices in soil conservation districts, with SCS assistance, 1956.		
Contour farming	acres	2,912,960
Cover cropping	"	3,738,053
Strip cropping	"	977,428
Stubble mulching	"	2,599,973
Range and pasture seeding	"	3,254,504
Tree planting	"	367,130
Improvement cutting	"	1,102,479
Wildlife area improvement	"	411,397
Drainage	"	1,452,989
Land leveling	"	575,023
Improved water application	"	1,611,836
Waterway development	"	85,873
Terracing	miles	57,628
Farm and ranch ponds	number	87,430

A National inventory of soil and water conservation needs was started during the year. Seven other agencies of the Department are assisting the Service in planning and executing this project. It is expected that the inventory, on a county by county and State by State basis, will be completed during the next 3 years.

WATERSHED PROTECTION AND FLOOD PREVENTION

Applications for Federal assistance on small watersheds, under provisions of Public Law 566, continued to come from local organizations throughout the Nation. During the year, 193 applications were received, making 617 from 46 States that had been received by December 31, 1956. Of these applications, 106 were approved for planning during the year, bringing the total to 229. Thirty-one of the small watersheds had been approved for operations and work was getting underway at the close of the year.

During the 1955 and 1956 sessions of their legislatures, 25 States passed new or amended legislation to further cooperation between local, State, and Federal agencies in carrying out activities under Public Law 566. In all, 45 different laws were passed in the 25 States. Legislatures of 5 States provided for State financial participation in the small watershed program.

Operations continued at a satisfactory rate on the 58 pilot watersheds established in 1953. Installation of works of improvement were more than 90 percent completed in 8 of these watersheds. During the year, 78 floodwater-retarding structures were completed, 113 stabilizing and sediment-control structures were built, 52 silt and debris basins constructed, and 43 miles of channel stabilization and improvement completed. This brings the total of structural work in the 58 pilot watersheds to: 197 floodwater-retarding structures; 1,427 stabilizing- and sediment-control structures; 166 silt and debris basins; and 123 miles of channel improvement

and stabilization. Land-treatment measures were keeping pace with the structural measures in most of the pilot watersheds.

Work plans were developed for 88 subwatersheds in the 11 flood-prevention watersheds started in 1947 under the Flood Control Act of 1936. This makes 278 subwatersheds, including more than 15 million acres, on which work plans had been developed at the end of the year. Both the structural work and land treatment progressed at a satisfactory rate. During the year, 82 floodwater-retarding structures were completed, 1,527 stabilizing and sediment-control structures were built, and 149 miles of channel improvement and stabilization accomplished. Total structural work in these 11 watersheds now includes: 431 floodwater-retarding structures; 5,962 stabilizing and sediment-control structures; 244 silt and debris basins; and 974 miles of channel improvement. About 25,000 acres of critical areas in these watersheds had been revegetated at the close of the year.

The Service obtained accurate snow pack information on more than 900 snow courses in the western States in the cooperative snow survey. In addition, information obtained from British Columbia on the snow pack of the upper Columbia River was made available as a part of the spring runoff prediction.

Cooperation was continued with other Federal agencies, especially with the Army Corps of Engineers and Bureau of Reclamation, on river basin investigations and planning. The river basin projects receiving most attention during the year were the lower Mississippi River, the Delaware River, and the upper Colorado River.

ASSISTANCE ON RELATED PROGRAMS

The Service continued to assist participants in the Agricultural Conservation Program at the request of county ASC committees. Last year most SCS assistance was given on permanent-type practices that should provide enduring benefits to the land. More than 558,000 ACP referrals from 464,000 farms and ranches came to SCS from ASC committees.

Field technicians counseled about 42,000 farmers and ranchers on conservation reserve and acreage reserve problems in connection with the Soil Bank Program. The Service also gave conservation assistance in the Rural Development Program and to the Farmers Home Administration and its farmer-clients in the soil and water conservation loan program. During the year, FHA insured loans for more than 12 million dollars to individuals and organizations for such purposes.

A new program that was shaping up rapidly as the year closed was the Great Plains Conservation Program, authorized by Public Law 1021. Secretary Benson assigned Department of Agriculture leadership to the Soil Conservation Service. This involves coordinating and making available to people in the Great Plains those facilities—technical assistance, cost sharing, and others—of the Department that can help them establish the land-use adjustments and conservation measures needed to stabilize agriculture in that region.

PLANT TECHNOLOGY

Increased attention was given to Service activity in plant technology. National policy in this field was crystallized during the year by administrative statements, including policy on range conservation and objectives and policies in biology. Policy statements on plant materials, agronomy, and woodland conservation were drafted.

Several significant developments resulted from the observational work with plant materials: *Zoysia* proved useful in grass waterways; *Wichuria rose* in holding gravelly stream banks; annual brome as orchard cover; and big trefoil as a legume on poorly drained lands. Special techniques were developed for increasing survival of conifers in field plantings.

A joint memorandum between the Service and the Fish and Wildlife Service served to correlate work of the two agencies. Among other provisions the Service will transfer funds to the Fish and Wildlife Service for biological surveys on two watershed projects.

ENGINEERING

Recruitment and training of engineers, especially in hydrology, geology, structural and hydraulic design, irrigation, and drainage, continued to receive major emphasis due to the limited supply of qualified men in these fields.

Cooperation was continued with other Federal agencies on sedimentation studies. The cooperative studies between SCS and the Geological Survey on the trap efficiency of floodwater-retarding structures received emphasis.

National standards for the installations of plastic, concrete, and metal irrigation pipelines were developed in conjunction with the plastics industry, concrete pipe associations, and steel plate fabricators. The uniform standards developed with these organizations should greatly facilitate technical problems of installation. Furthermore, the acceptance of the standards by industry should assure general acceptance by contractors and dealers involved in such installations.

The continued expansion of irrigation into the eastern humid area of the country brought up many technical problems. The expansion of surface irrigation into this region necessitated revisions and additions to some of the original irrigation guides and preparation of a new booklet on "Conservation Irrigation in the Humid Areas."

Drainage operations, especially in the coastal plains, continued at a high level. In line with the Department's policy, the Service curtailed all assistance on drainage where the primary purpose was to bring new land into cultivation.

Studies of parallel terracing were continued in several States. The idea has been found adaptable in all States where trials were made. Farmers who have tried parallel terraces praise them highly because of the greater ease of farming.

Attention was given to the smoothing of field surfaces prior to construction of terraces. The greatest need for smoothing is on fields where old terraces are

to be replaced with new ones. Smoothing also is desirable on many fields of irregular topography where new terraces are to be installed, especially if parallel terraces are to be used.

The further development of working relations with manufacturers, distributors, and retailers of farm equipment was continued.

A contract was entered into for use of an electronic digital computer to compute cross sections for plotting water-surface profiles. This has been of special importance in designing floodwater-retarding and other water-impounding structures.

Permission was obtained to negotiate contracts for engineering work with private engineering firms. Although more expensive, this use of private engineers may make it possible to supplement Service engineering staffs in some localities where the need is acute.

Livestock Pond With Wildlife Island

By BJORN DAVIDSON

A COMBINATION stockwater pond and wildlife area was desired by Fred P. Steuerwald on his 640-acre farm west of Huron, S. Dak. And that is what he built.

A swale runs through Steuerwald's farm, fed by runoff from an adjacent farm as well as his own. Steuerwald watched the water flow across his land for years. He wanted to store some of it for his livestock and also for the benefit of wildlife.

In 1952, he called on supervisors of the Beadle County Soil Conservation District for assistance in constructing the pond. When Soil Conservation Service technicians, assisting the district, were laying out the pond, Steuerwald discussed the possibility of dredging the swale to create an island in the center of the pond.

Surveys showed that when the stockwater dugout was full, sufficient water would be backed up to provide a stable supply for wildlife on both sides of the island for a distance of a quarter of a mile.

Steuerwald hired a contractor to dig out the swale and deposit the fill in the center to form an island that would have water 3 to 4 feet deep on both sides. This work cost him more than \$1,000.

Note.—The author is work unit conservationist, Soil Conservation Service, Huron, S. Dak.



Stockwater and wildlife pond on the Steuerwald farm.

He fenced the wildlife area to exclude livestock. The district supplied him with tall wheatgrass seed to plant on the island and disturbed areas, as well as willows and cottonwoods to plant along the waterline.

"Today, I have a haven for wildlife," Steuerwald reports. "Pheasants and partridges are nesting in the cover on the island, while ducks nest in the fenced area."

"Now, only about 600 feet from the busiest highway in the State, we have various types of wildlife as well as a year-round recreation spot for the children in the neighborhood. And, inci-

dentally, there are 8 broods of duck on the pond this year," he declares.

Steuerwald also uses other soil and water conservation practices. He has fenced his pastures so that livestock grazing on any of them has access to the pond. The first wind stripcropping in Beadle County was established on this farm by Steuerwald in 1935, and all strips are fenced for grazing. He practices crop rotations, and has established a farmstead windbreak. All drainage on the farm goes into the wildlife area.

Steuerwald was a winner in the Greater South Dakota Associations' conservation contest in 1953.

Bentonite "Swell"

Bentonite Proves to Be One of the Cheapest, Satisfactory Products Found for Lining Leaky Irrigation Ditches.

By BRICE F. LEE

MOST irrigation farmers have long known that from 10 to 90 percent of their water might be lost from leaky ditches between the headgate and the farm. Many farmers are now combating these terrific and costly losses by lining ditches with bentonite, a colloidal clay.

When it is mixed in the correct proportion

with water, this clay will swell up to fifteen times its dry volume. This property makes it valuable for ditch linings.

The process by which bentonite stops ditch seepage is as old as flowing water itself. Irrigators know that leakage losses of ditch water are greater with clear water than they are with muddy water. The silty material found in muddy water settles out on the bottom of ditch beds,

Note.—The author is soil scientist, Soil Conservation Service, Durango, Colo.

seals the cracks and crevices, and stops much of the seepage loss. The chief disadvantage of the silt layer as a ditch lining is that it is exposed to the flowing water and it cracks when dry.

Bentonite's action closely resembles the action of the mud in muddy water. The extremely fine bentonite clay particles are suspended in water during the lining process. The water carries these particles and where the water goes, so goes the bentonite. As the suspension flows through cracks and crevices, the bentonite particles collect, layer upon layer, until the leaky spots are sealed. The actual bentonite lining process takes place below the surface of the channel. This makes it more resistant to the flowing water.

It is true that the conventional linings, such as concrete, are effective. But they have disadvantages, the chief one being their high cost. Bentonite is relatively inexpensive. One can line 7 miles of ditch with bentonite for the same amount of money it takes to line 1 mile with concrete.

Another advantage of bentonite over the conventional linings is its ease of installation. The installation is convenient since the waterflow needs to be interrupted for only a short time. The small amount of equipment needed is simple and economical. A section of the ditch is dammed off, bentonite is mixed in the water, and the water carries it to the spots which need lining. This eliminates the expensive and time-consuming problem of locating the permeable sections of the ditches.

Excavations, which are necessary in most other ditch-lining projects, are eliminated when using bentonite. Bentonite linings take no more time or effort than cleaning a ditch or canal. You save both time and money. It means more time on your hands and more dollars in your pocket.

In addition to saving water, bentonite linings are used advantageously in saving land. The land in some areas is slowly being ruined by too much water. Leakage from ditches and canals causes the land nearby to become seepy—thus putting good land out of production. The water table under certain of these areas was lowered from 1 to 3 feet after the channels were lined with this colloidal clay.

What is involved in lining a canal with bentonite? Two methods are currently being used: the full-flow method and the ponding method.

The full-flow method works well in small canals and ditches and in those where waterflow can be interrupted for only a short time. The only special equipment needed in this operation is an air compressor.

The first step in the full-flow procedure is to turn the water out of the ditch and clear the ditch of weeds. Dry bentonite is then placed at the head end of the ditch in a foot-thick layer, and a check dam is put in just below the layer of bentonite. The water is turned in and allowed to fill the ditch and flow over the check dam.



Dumping Bentonite into a ditch where water has temporarily been cut off.

The layer of clay is "muddied up" by jetting compressed air into it. The action of this compressed air creates a suspension of bentonite particles in the water. The clay-water mixture flows downstream and seals the leaky sections of the ditch on its way.

The ponding method is suitable for lining larger canals where check structures are already available. The bentonite and water are mixed together at the head of the canal. The mixture is allowed to fill the first section of the canal and flow over the check dam into the next



Air compressor is used to muddy water after Bentonite has been placed in the ditch.

section, and so on, until the entire length of the canal has been lined. Canals up to 12 miles in length have been lined by this method.

Researchers, who are currently conducting bentonite research projects, are obtaining very satisfactory results. However, they do not claim that bentonite linings are a cure-all for seepage troubles. There is no one cure-all. The commonly used conventional linings have their limitations, too.

Problems relating to the use of bentonite ditch linings are being solved rapidly, but a large one still exists. Bentonite linings need to be adapted to all the soil types through which ditches and canals run. Current research is being directed toward this problem. Bentonite-lined canals running through sandy and loessial soils have produced the most satisfactory results to date. Less favorable results were obtained when canals ran through rocky and gravelly soils.

Even though difficulties have arisen in its use, bentonite still remains a "SWELL" friend to irrigation.

LUMBER PRODUCTION.—The nation's sawmills produced 37.5 billion board feet of lumber during 1956, enough to build about 3.8 million three-bedroom homes, according to the National Lumber Manufacturers Association.

KIWANIS INTERNATIONAL.—The Committee on Agriculture and Conservation of Kiwanis International has taken for its theme in 1957: "Promoting Agriculture and Conservation Is A Year-Round Job." The first objective suggested by the committee is: "Participation by every club in agriculture and conservation projects—completing at least one project each quarter."

BANKER ADVISES CONSERVATION

A Retired Banker Considers Soil and Water Conservation an Investment That Will Pay Dividends and Also Improve the Land for Future Generations.

By **JOHN M. CROSS**
and **PHILIP K. CORNELISON**

HOGAN Jackson of Albertville, Ala., advises every young man who owns land to practice soil and water conservation. His advice stems from experience. He owns land and practices soil and water conservation. He also believes in doing the job quickly and thoroughly.

Mr. Jackson spent a large portion of his 84 years in the banking business. He established the Albertville National Bank in 1904 and served as its president for 40 years. He helped establish 2 other banks in neighboring towns. During the past few years he has been looking after his farms and other interests while his son serves as president of the Albertville Bank.

Soil and water conservation to Banker Jackson is an investment. It increases the value and improves the productive capacity of the soil. It also pays good dividends. But Mr. Jackson has

Note.—The authors are, respectively, work unit conservationist and farm planner, Soil Conservation Service, Marshall County, Ala.



Hogan Jackson (left) and SCS Technician inspect terrace construction.

another motive: "I want to leave the land a little better than I found it," he says.

He began his conservation work on his 325-acre farm near Albertville with technical assistance given him by SCS technicians working with the Northeast Alabama Soil Conservation District. Early in 1956, he made a soil and water conservation plan for the farm that spells out a step-by-step approach. He started immediately putting the plan on the land.

During the first year Mr. Jackson was able to make most of the needed land-use changes and apply most of the conservation measures planned. He expects to finish the job, except for maintenance, during the next year.



Newly constructed grass waterway on the Hogan Jackson farm.

The Jackson farm now has 15 newly sodded grass waterways. More than 12,000 feet of terraces have been constructed, and another 40,000 feet are under construction. Most of them are laid out parallel. He has cleared and planted to tall fescue and clover a wet field that was not producing. And, of course, an approved rotation is practiced on each field.

Six acres of field borders frame each field on the farm. The borders are about 20 feet wide near roads and fences and planted to grass and clover. In addition to checking erosion, these borders serve as turnaround areas for machinery. Near the woodlands, the borders are about 30 feet wide and planted to bicolor lespedeza to furnish food and cover for game birds.



Selective cutting of woodland on the Jackson farm.

His woodland-management program is well underway. Most of the pine trees have been thinned according to the $D + 6$ formula. The hardwood cull trees are rapidly being cut. He has planted 12,000 pine seedlings and plans to plant 40,000 more next fall.

A newly constructed pond with $21\frac{1}{2}$ surface acres is already furnishing water for livestock and will be stocked with fish.

The Agricultural Conservation Program and Soil Bank have helped share the costs for many of the conservation practices. Yet, Mr. Jackson has a considerable initial investment in the work. He thinks, however, that the dividends from the investment will soon amortize his capital outlay.



Newly completed farm pond on the Hogan Jackson farm.



THE FARMER AND HIS CUSTOMERS. By Ladd Haystead. 92 pp. Illustrated. 1957. Norman: University of Oklahoma Press. \$2.75.

In this small book, Ladd Haystead comes to the defense of farmers. He points out how much blame the farmer has to take for current high prices of food. He discusses such questions as: Why are many farmers going broke while food prices are continuing to rise? Are urbanites justified in being critical of farmers for accepting government subsidies at this time? Is it necessary that the business of farming be sound to keep the country prosperous?

The author points out that with the continual rise in food prices, the farmer's share of the returns is becoming less and less. He thinks the urban housewife does not realize that this is largely caused by increased wages demanded by city people for transporting, processing, and preparing these products. In the meantime, the farmer's cost of living is necessarily increasing as is that of the rest of us. It is his decreased returns and increased costs, since the development of the war-expanded farm plant, that has caused rural distress, surpluses, and government financial assistance.

Such a situation may have serious repercussions in the future, according to the author. Farming is the second largest industry in the country and needs to be integrated properly into the national economy. This book examines the position farming has today, its problems, its weaknesses, and its place in the United States of the future.

The book is well written. Its style is informal and easy to read. It should appeal to many different groups of readers.

—THEODORE A. NEUBAUER

TREE PLANTING BOOMS.—From 77,000 trees in 1953 to more than 300,000 in 1956!

That's how the interest in farm woodlands has spurted in the Caledonia County Soil Conservation District in north-central Vermont. Tree planting is of special importance to farmers in this district. Much of the land is unfit for cultivated crops or meadow but it produces excellent softwood. Tree planting is returning this land to its best use.

For years, even after the district was formed in 1946, nothing was done to use the many sloping fields that had become too played out to grow good hay or any other crop. Up to 1954 only 157 acres had been restored to woodland.

In 1954, Ken Danielson took a look around. He was then the technician in charge of Soil Conservation Service work in the district. He figured it was time to do something about making all the idle land—even abandoned farms—useful again.

Why weren't farmers planting trees? Danielson talked the matter over with the district supervisors, Paul Reed, the county forester, Phil Grimes, the county agricultural agent, and others. They found that the State nursery could provide trees at a fair price. The State Forest Service was glad to transport the seedlings. Technicians were ready to show farmers how the planting should be done.

What was the drawback? It was the old-fashioned handplanting.

So the district bought a tree-planting machine. The district supervisors also arranged for a local man to furnish a tractor and a two-man crew to operate the machine. Then the district's tree-planting service was offered to cooperating farmers.

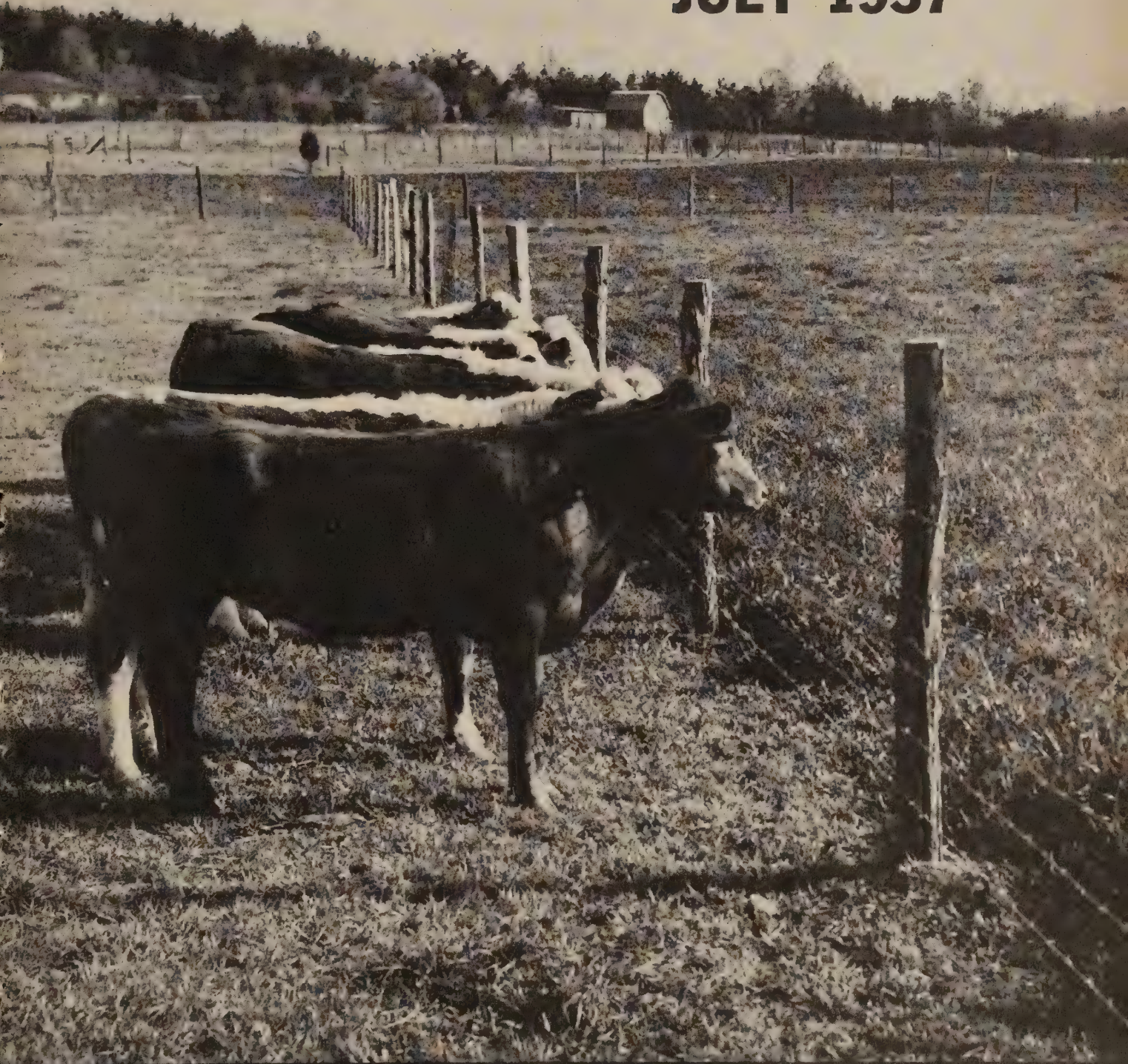
Interest in tree planting quickly took a spurt. Before long the district had to buy another tree-planting machine to meet demands.

Of course the machine can't be used on really steep hillsides. These are still hand-planted. But it's the machine planting that's responsible for the boom. It was the supervisor's foresight in providing the machine that turned the tide, farmers say. Supervisors responsible for the boom were John E. Somers, Clarence Burrington, Paul Nelson, Joseph Menard, and Kenneth Ward.

The farmers are more than satisfied with the district's tree-planting service. They're enthusiastic. One farmer alone, Clarence Ackley, in 1956 planted almost 100 acres of abandoned farmland.

—ALLEN R. GRAY

JULY 1957



Soil Conservation

Soil Conservation Service • U. S. Department of Agriculture

SOIL CONSERVATION.

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U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

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TOM DALE
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 18, 1955. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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JULY—1957

VOL. XXII—NO. 12



OUR SOIL ★ OUR STRENGTH

WATERSHED CONSERVATION is not something apart, or something to take the place of soil conservation district programs. Actually, it is, in effect, the regular program of the districts, supplemented by the addition of flood prevention and other measures in small tributaries and by wider participation by whole communities. It is soil conservation district programs expanded to meet some of the community-type land and water problems which the districts or other local interests do not have the facilities to handle, by themselves.

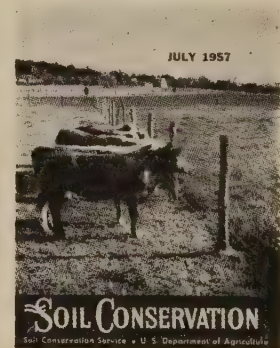
—D. A. Williams, Administrator
Soil Conservation Service.

MORE AND CHEAPER FOOD FROM THE SAME ACRES.—Today, farmers are producing 40 percent more on virtually the same amount of land they farmed before World War II.

Corn yields are up 55 percent—wheat, about 35 percent—cotton, 65 percent—potatoes, over 100 percent. Each cow is giving 30 percent more milk and each hen is laying 45 percent more eggs.

Wages paid for an average hour of manufacturing labor will now buy about 32 percent more food than an hour's wages would buy in 1939.

—Louis H. Wilson,
National Plant Food Institute.



FRONT COVER.—These yearlings may not know about the fertilizing and re-seeding of that pasture across the fence, but they know that the grass is lush and greener.

—Photo by Leon J. Sisk

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Use of Fertilizer and Lime

No. 25

This is the twenty-fifth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By J. RICHARD ADAMS

THE 1954 Census of Agriculture gives greater detail on the use of commercial fertilizers and liming materials than any other census report. Data are given, by counties, on the total pasture and crop acreages fertilized and limed, and the total quantity and cost of commercial fertilizers and liming materials used in the continental United States during the calendar year 1954.

The census shows that farmers spent more than a billion dollars in 1954 for 18,869,117 tons of fertilizer at an average price of \$56.94 per ton. Essentially all this fertilizer was applied during the year in which it was purchased. Almost three times as much fertilizer was used in 1954 as in 1939. And, the increase in plant nutrients applied was even greater because much of the fertilizer was in more concentrated form.

Although the price of fertilizer increased during this 15-year period, the increase was not as great as the increase in prices paid for most other farm purchases. Index numbers of prices paid by farmers for certain commodities in 1939 and 1954, respectively, were: fertilizers, 101 and 155; farm machinery, 155 and 313; feed, 93 and 226; and seed, 92 and 226.

Fertilizer usage was greatest in the Eastern half of the United States. More than 1 million tons of fertilizer were used in each of 5

States of this area. Three of these States, in the south Atlantic region, used almost 93 percent as much fertilizer as all States west of the Mississippi River. Over 1 million tons of fertilizer were used in 1954 in each region of the United States except New England and the mountain region. The consumption in each of these 2 regions was below 400,000 tons.

Nearly 32 percent of the fertilizer was used on corn in comparison to 21.8 percent applied to corn in 1942. On the other hand, the use on cotton was 9.7 percent of the total in 1954 and 14.4 percent in 1942. Similar comparisons cannot be made for the other crops owing to lack of uniformity in classification.

Rates of fertilizer application per fertilized acre are given for pastures and specific crops. It should be noted, however, that these comparisons and all other data are based on quantities of fertilizer mixtures and materials and not on quantities of nutrients.

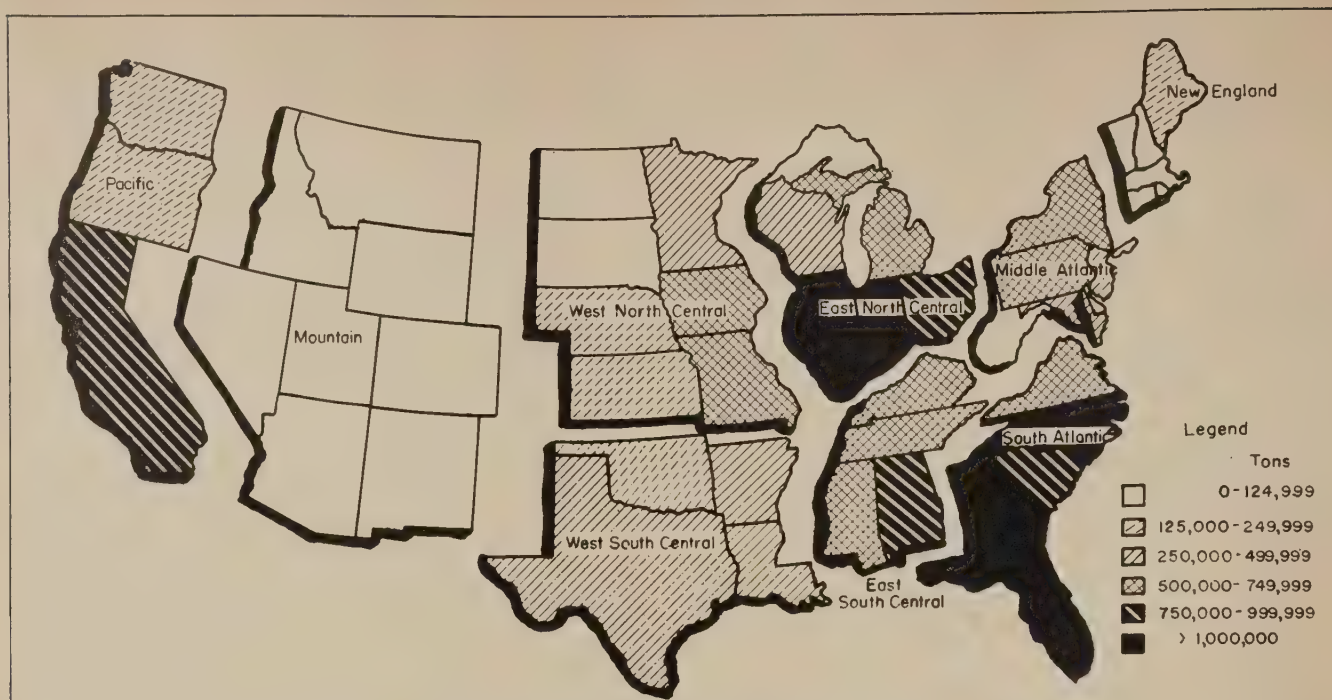
Hay and cropland pasture in the United States received an average of 302 pounds of fertilizer per fertilized acre. The rate of application was 1½ times as great in eastern regions as in western regions. The highest average application was 488 pounds per acre in Virginia; the lowest was 96 pounds per acre in North Dakota.

The use of fertilizer on other pasture closely paralleled the use on hay and cropland pasture, but the rate of application on other pasture was lower than on hay and cropland pasture. In only 2 regions, however, did the average rate on other pasture vary more than 10 percent from that used on hay and cropland pasture.

The average rate of fertilizer application on fruits, vegetables, and potatoes, receiving fertilizer, varied from 1,309 pounds per acre in the south Atlantic region to 268 pounds in the west north-central region, with an average for the United States of 850 pounds.

Over 6 million tons of fertilizer were used on more than 46 million acres of corn. Rates of application were highest in the New England

Note:—The author is with the fertilizer and agricultural lime section, soil and water conservation research division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Md.



Fertilizer consumption by States, 1954.

States, with an average of 523 pounds per fertilized acre. The application rate in Maine was 702 pounds. The rate of use in the west north-central states was lowest; only 78 pounds were used per fertilized acre of corn in North Dakota.

The use of fertilizer on cotton east of the Mississippi River was almost 80 percent higher per acre than the use west of the Mississippi. Fertilizer was used on cotton in South Carolina at the rate of 597 pounds per fertilized acre. This rate was exceeded in Florida but on a relatively small acreage. The highest rate, 383 pounds per acre, west of the Mississippi River was used in California.

The application rate per fertilized acre of wheat in the eastern part of the country was more than $2\frac{1}{2}$ times that west of the Mississippi River. Application rates ranged from 414 pounds per acre in New Jersey to 43 in Montana.

Tobacco was fertilized at the highest rate of any of the crops listed. The United States average was 1,347 pounds of fertilizer per fertilized acre. Tobacco grown in New England received over $1\frac{1}{2}$ tons per acre, whereas in other sections it received a little over half a ton per acre.

Fertilizer was used for sugar beets at the rate of 336 pounds per fertilized acre in the mountain region, exclusive of New Mexico, Ari-

zona, and Nevada. Fertilizer application rates on oats varied from 144 to 220 pounds per fertilized acre for an average of 199 pounds. Fertilizer was applied to rice at an average rate of 212 pounds per acre in California. This was the only State for which data were obtained on the use of fertilizer for rice.

A total of 17,276,170 tons of liming materials were purchased in 1954 at a cost of almost \$69.5 million. Liming materials included limestone, hydrated and burnt lime, oyster shells, and similar materials. They were applied at the rate of a little over $1\frac{1}{2}$ tons per acre on less than 11 percent of the farms in the country. More than three-quarters of the liming materials were used in the New England, middle Atlantic, east north-central, and west north-central regions.

The 1954 census reports also show the use of fertilizers for specified crops and the use of lime on irrigated and nonirrigated farms by economic areas. The data are broken down further by economic class of farm, by tenure of farm operator, and by type of farm. The rate of use per acre is given for selected crops for selected economic areas.

For further details on the use of fertilizers and liming materials in the United States in 1954 see:

- U. S. Bureau of the Census, U. S. Census of Agriculture: 1954.
- Vol. II, General Report, Chapter IV, Farm Labor, use of fertilizer, farm expenditures, cash rent.
- Vol. III, Special Reports, Part 10, Use of fertilizer and lime.

Good Grazing

A New Mexico Rancher Has Come Through Two Depressions and Two Droughts With His Range in Excellent Condition, Mainly Because of Good Grazing Management and Other Conservation Practices.

By N. E. TRAMMEL

A long-time rancher, W. F. Pitt, of McKinley County, N. Mex., literally loves grass. It is a great pleasure to ride over Pitt's range and observe the waving seas of galleta, blue gramma, sacaton, and western wheatgrass along the bottomlands, and to note the well-vegetated hillsides.

Pitt first came to the Crownpoint area of McKinley County in 1918 along with his father and other members of the family. The old A. Z. ranch was purchased and he assumed full management in 1923.

The ranch consists of 70 sections, nearly 45,000 acres, all owned by Pitt, except State-owned sections, which he leases. It is divided into 10 pastures. He has put up many more miles of fence since the boundaries were fenced

in 1919 and has built 15 stock water ponds. Three artesian wells and two windmill wells also provide water for the livestock.

Erosion-control dams and water-spreading structures have been built in favorable locations. Some of these structures were built several years ago. They have functioned many times. Flooded areas resulting from these structures have provided the only green grass available at various times. They have been of great benefit both during dry as well as wet years, according to Pitt.

The ranch has been so managed, however, that many "natural spreading areas" can be found. Instead of gullied bottomlands, as generally observed, one sees a waving sea of grass along these areas. This can be attributed to Pitt's management and his great belief in good grass.

Native grasses have been given a chance to grow and become vigorous. Pitt has proved that nature will heal the scars of erosion and cure sick land if given a chance. Many old gullies now are healed over with a thick growth of desirable grasses. Hillsides are covered with good stands of palatable grasses, such as bluegrama and galleta, in thrifty condition.

Average annual precipitation for the Crownpoint area is from 9 to 11 inches. Many years not even this amount falls. Rains are unpredictable. This makes a fixed system of deferred and rotational grazing difficult to carry out. Cattle must be moved from pasture to pasture

Note.—The author is work unit conservationist, Soil Conservation Service, Gallup, N. Mex.



An old gully on the W. F. Pitt ranch that has been healed by native grasses.

more or less in accordance with the rainfall pattern. This, Pitt constantly does, keeping cattle scattered over his range wherever there is grass.

Pitt has survived two depressions, one following World War I and the other during the 1930's. And he is now going through his second long drought.

"I concluded years ago that moving cattle to distant pastures during dry years was costly in time, money, and effort," he said. "It occurred to me that saving a reserve of grass during wet years for use during dry times might be the answer. I tried this and found that it removed much financial strain and worry."

Pitt's system has been one of keeping enough grass in reserve to tide him over the dry times. He feels that old grass left on the ground is not wasted, but of great benefit. Cattle will eat this old forage if no green grass is available. It is high in food value. It improves soil conditions by making the ground absorb moisture better. Rains benefit lands in this condition because of little or no runoff. Such rangeland responds to light showers to a greater extent than ranges in depleted condition.

This rancher conducts a detailed study of his grasslands each year after the growing season has passed. He rides his range, not only in his pickup truck along roads and near water holes but also on horseback over the more inaccessible spots. In this way he observes how well his grass has grown. He estimates the amount of feed available, always keeping some in reserve should it turn dry the following spring. He adjusts his livestock numbers to the amount of grass available.

Pitt believes that the rangeland around Crownpoint and vicinity should never be stocked heavier than 10 head of cattle per section, even in wet years. During dry times stocking should be less.

Registered and commercial cattle both are grazed on the ranch. Cotton seedcake is fed during winter months. Hay is not necessary because there is always sufficient old grass or "hay on the ground." During recent dry years, Pitt has never found it necessary to purchase feed under government emergency programs.

The 70 sections under Pitt's control has been

managed so they now support a much better, more vigorous vegetation, than before. Erosion control and water-spreading structures have helped, but the main benefit has resulted from proper grazing management.

This rancher started cooperating with the Soil Conservation Service during the early days of its existence. Under this program some fencing and other work was done, with Pitt furnishing materials and other contributions required at that time. He has participated in the Agricultural Conservation Program from time to time.

When the McKinley Soil Conservation District was organized in 1947, Pitt was elected as a supervisor. He served in this capacity until 1954.

HAWAIIAN BANANA KING.—Charles Shiraishi, South Oahu Soil Conservation District director, and a 1949 graduate of the University of Hawaii, farms 40 acres near Honolulu. Among his business associates he is known as "The Banana King".

Twenty years ago his dad, mother, and he came from the Mainland, east of San Francisco and Oakland, to Hawaii. They settled on a tract of land in Manoa Valley and started growing bananas. Today young Shiraishi is using modern soil- and water-conservation practices, producing high-yielding plants, and supplying first-quality fruit to the Hawaiian banana market.



Charles Shiraishi near one of his banana trees.

The home place consists of 20 acres of rented land in Manoa Valley. Recently, the Shiraishis bought another farm in Palolo Valley where banana culture also is carried on. Every day the men harvest the fields and take to market select bananas.

Careful soil management practices are used—all stalks and leaves are left in the field as a mulch for protection of the soil. All weeds and grasses are kept from the fields by spraying. No hoeing or cultivating is done so that all plant roots can help hold the soil in place.

"The Soil Conservation Service technicians, through our Soil Conservation District, give us the help we need for long-time high production", says Mr. Shiraishi. "What worries me now is the speed with which so many acres of our high-producing banana fields are going into subdivisions for homes. The subdividers want the best land and push the farmers further up the steeper, more eroding slopes."

According to this young district director, farmers that work together and use the best possible soil- and water-conservation practices, can give their agricultural community continued long-time high production.

—A. W. EMERSON

Raccoon Conservation

A County Coon Hunters Association Boosts Soil and Water Conservation as a Means of Getting More and Better Raccoons.

By BARRINGTON KING

MOST folks take it for granted that quail hunters and duck hunters are interested in soil and water conservation. Proper use and treatment of these resources improve the habitat for quail and waterfowl.

But when the Anderson County, S. C., Coon Hunters Association asked the local SCS representatives to speak at their regular meeting, the connection wasn't so readily apparent.

The SCS folks, though, worked up the best program they could for the meeting. It included as an introduction a brief history of soil and water conservation, an outline of the organization of districts, and the SCS and district supervisors relationship.

A detailed explanation was given of soil- and water-conservation practices, including treatment of areas for wildlife. Slides were used to point up the improvements brought about by sound conservation treatment.

The SCS workers weren't sure they had put their message across from the coon hunters' angle. So, after about a 50-minute discussion, they asked for questions. And for the next 30 minutes, the questions flew thick and fast. The hunters' interest in and knowledge of the subject was amazing.

Many members of the association, it turned out, were district cooperators. Some lived in town and had no farms. But the city members apparently were just as interested as the farmers.

Jack Earle, secretary-treasurer of the Coon Hunters Association, summed up the interest of his group at the conclusion of the meeting.

"We have found that wildlife is most abundant where farmers have good soil and water conservation practices on their land," he said. "And the reasons for this are not difficult to find.

"For example, the cover crops and hedgerows that keep topsoil from washing away and help rebuild worn-out lands also provide food and cover for wildlife. Along these hedgerows you find muscadines, wild grapes, and persimmons — the chief foods for raccoons in the fall of the year.

"Wildlife's greatest hazard is fire," he continued. "Fire destroys the essential food for wildlife and destroys the hollow trees which are the favorite home of the raccoon. The services offered by our soil conservation district include measures to prevent fires and provide wildlife food and cover.

"Fish ponds also are a part of the soil conservation district program. They present a good example of the benefits of conservation farming to both the farmer and the sportsman. They provide fishing, swimming, boating, and water for cattle and wildlife.

"To the coon hunter, ponds are of special importance," he pointed out. "These small bodies of water that dot the countryside are a major source of food for the raccoon. These animals feed on frogs, spring lizards, and crawfish, all of which are found in ponds.

"All true sportsmen have a vital interest in the practices that improve soil fertility," he summarized. "The reason for this is simple. Measures taken to conserve the soil serve a double purpose by also helping to protect wildlife."

Note:—The author is information specialist, Soil Conservation Service, Spartanburg, S. C.

The Washita Story

An Unruly River is Being Tamed and the Land in Its Watershed Conserved Mainly Because a Group of Citizens Persistently Fought, for 30 Years, to Bring About Concerted Federal, State and Local Cooperation in Solving the Problems.

By TARLETON JENKINS and HARRY M. CHAMBERS

IF a vision can be workworn and dream-patched, the one that is turning into reality on Oklahoma's Washita River merits that description.

This particular vision, you see, is a relatively old one. Some of the people who first conceived it have moved away and some have passed away. Those who are still around find it hard to realize that the events now taking place along the mud-choked stream that meanders 200-odd miles across southwest Oklahoma are the achievements they worked for so long.

Otto Wray, Red Males, Lloyd Church, George Wingo, John Cassady, Jess DeWeese, and many others — the ones who first put their heads together to give promise to their hopes — now watch the fulfillment of their dreams with a nod of satisfaction.

In those early years progress seemed discouragingly slow. Often it was delayed by the clash of interests in high places, or by the emergence of new principles in watershed treatment that had to be weighed and tested, and by an upheaval that tossed into oblivion many other well-laid plans—World War II.

The Washita job, more recently, has been setting a fast pace. It has attracted visitors by the thousands from far-off corners. Its story has commanded the attention of audiences across the Nation. It has been told with millions of words in magazines, books, and newspapers.

Residents in other watersheds, eager for results, observe the rate of progress in the Washita and are surprised. Why, they wonder, does this one program move so swiftly while some of the others are so slow?

For the true answer you must turn back a lot of years, to the early 1930's and even before. You would go back to the time when the groups of citizens were gathering in offices, stores, and schoolhouses, to ask over and over "What can we do?"

You would need to stand with them during times of flood, watching the angry waters as they reached across creek bottoms, across roadways and bridges, tearing at railroads, wrecking homes and barns, wrenching out fences, gouging out soil by the thousands of tons, ruining crops, and sweeping livestock to destruction.

You likely would talk to the residents of Fort Cobb, which was Wingo's home, and the town-folk in Hammon farther upstream, where E. B. Savage lived.

The Fort Cobb flood in 1927 was one of the worst. It cost thousands of dollars in damage. Hammon, in 1934, took one of the river's cruel-



Main street of Fort Cobb, Okla., April, 1927.

Note:—The authors, both of The Soil Conservation Service, are respectively, information specialist, Fort Worth, Tex., and deputy state conservationist, Stillwater, Okla.



The Washita at flood stage, near Pauls Valley, Okla.

est blows. Seventeen people died one night in April when a cloudburst over Quartermaster Creek watershed brought a sudden head rise into the town.

Up and down the stream, and especially along its tributaries, it was the same. At Clinton, Chickasha, Anadarko, and Pauls Valley and areas in between there was the heartbreak of sudden loss in property, crops, livestock, and human lives.

Following the April 1927 flood at Fort Cobb, the engineers of the U. S. Army checked up on a site for a dam large enough to give protection to the town from the floodwaters of Pond (Cobb) Creek. The preliminary report was ready in 1930.

The dam, northwest of Fort Cobb, was to be 70 feet high and 3,800 feet long. It would receive the runoff from 190 square miles and cost \$1,089,200. (A larger structure, for flood control, irrigation and water supply, has more recently been authorized for construction by the Bureau of Reclamation.)

Almost everyone in those years was thinking only of a system of big dams to corral the

unpredictable river. Oklahoma's Division of Water Resources published a tailored plan for 29 large dams on the Washita.

However, plans calling for big dams and large areas for flood-control impoundments, did not meet with wholesale approval. Landowners whose bottomlands would be covered by impounded water were adamant in their objections. Some of these lands are of the State's best, with deep, rich topsoil.

The Washita River and its tributaries, as a matter of geologic fact, are somewhat out of character for streams in that area. Most streams have a wide streambed but a relatively narrow flood plain. The streambed of the Washita is narrow but the flood plains of it and its feeder streams are wide and highly productive; a fact that accounts, in part, for the high benefits gained from investment in flood prevention.

Geologists explain that the Washita Valley, thousands of years ago, must have been a huge lake backed up by Oklahoma's Arbuckle Mountains. The River finally cut through the mountains, leaving the broad, flat bottomlands to the west.

Actually, there is a larger total acreage of bottomlands on the tributaries of the Washita than on the main stream itself—approximately 265,000 acres of creek bottomlands to about 112,000 acres in the main Washita plain. The creeks flood oftener; some areas average 9 floods a year. The highest frequency of flooding on any part of the main stem averages just over twice a year.

By the midthirties the term “soil conservation” was being used more often in discussion of flood prevention on the Washita. Soon after the Hammon flood of 1934, a series of meetings were held on soil conservation, water conservation, and flood control at Clinton, Anadarko, Cheyenne, Chickasha, Pauls Valley, and other places.

An organization was formed, with the impressive title of “Washita Valley Soil Conservation and Flood Control Association.” Judge Lawrence of Anadarko was elected president of the association; E. B. Savage was named vice president. Jess DeWeese of Custer City spearheaded the membership drive. All it took to become a member was to sign one’s name to a petition requesting the Soil Conservation Service to use the entire Washita watershed as a demonstration area for soil and water conservation. Jess and his coworkers got more than 10,000 names on the petition and sent it to H. H. Bennett, then Chief of SCS.

This Association failed to get the entire watershed designated as a demonstration area; but several communities did get smaller demonstration areas or CCC Camps to work on soil conservation.

In the meantime, the Fort Cobb people were still working to get their flood-control dam. The



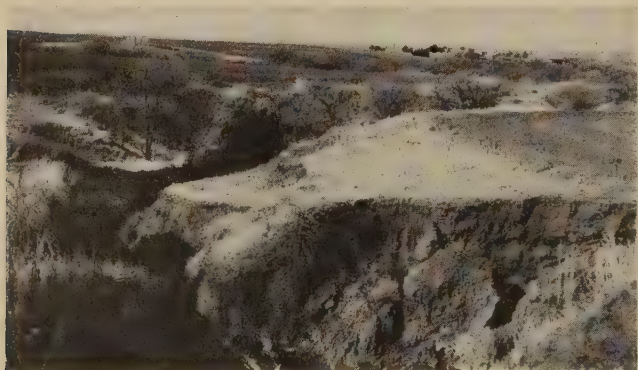
Flood scour and silt deposit on a bottomland field near a tributary of the Washita.

Chamber of Commerce sent Wingo to Washington, D. C., in 1934, to ask for help on the Cobb Creek Dam proposal. He appealed to the National Rivers and Harbors Congress, then in session. The following resolution was the result: “The proposed dam and reservoir on Cobb Creek on Washita River in Oklahoma is hereby approved as economically sound and necessary for the protection of lives and property of the people of that vicinity.”

In 1936, Congress passed the Omnibus Flood Control Bill. This put investigations of waterways for flood control in the hands of the War Department and “investigations of watersheds and measures for runoff and waterflow retardation . . . under the jurisdiction of the U. S. Department of Agriculture.” It touched off excitement like a spring flood does along the Washita. And, obviously because of the earlier interest shown by the citizens, the Washita watershed was chosen for study.

In February 1938, a group of leaders met in Chickasha. They identified themselves as the Washita Valley Improvement Committee. A Cheyenne banker, L. L. Males, was chairman. They agreed that a tighter knit organization should be formed representing all interests in the watershed.

Two years later the Washita Valley Improvement Association came into being. Otto Wray of Fort Cobb was chosen president. Vice presidents were Dick Longmire of Pauls Valley, Wesley Phillips of Foss, and R. L. Wheeler of



A typical gully in the upper Washita watershed.

Chickasha. Mrs. Lula K. Pratt of Cheyenne was named secretary-treasurer.

In September, 1940, Otto Wray led a group of association representatives to Great Falls, Mont., to meet with the director of the Bureau of Reclamation and other Federal officials. They learned that the Corps of Engineers and the Department of Agriculture, because of the Nation's preparedness program, had abandoned for the time all work on the Washita program.

A year later came the Pearl Harbor attack. The Soil Conservation Service hurried through the study it had been making under the authority of the Flood Control Act of 1936. Its report, dated September 17, 1943, was one of the first such reports completed and became the basis for later legislation.

The Congress, in 1944, with the Nation seemingly on the way to victory, passed a Flood Control Act designating 11 watersheds in the United States for work in flood prevention. One of these was the Washita; and the job was in the hands of the Soil Conservation Service.

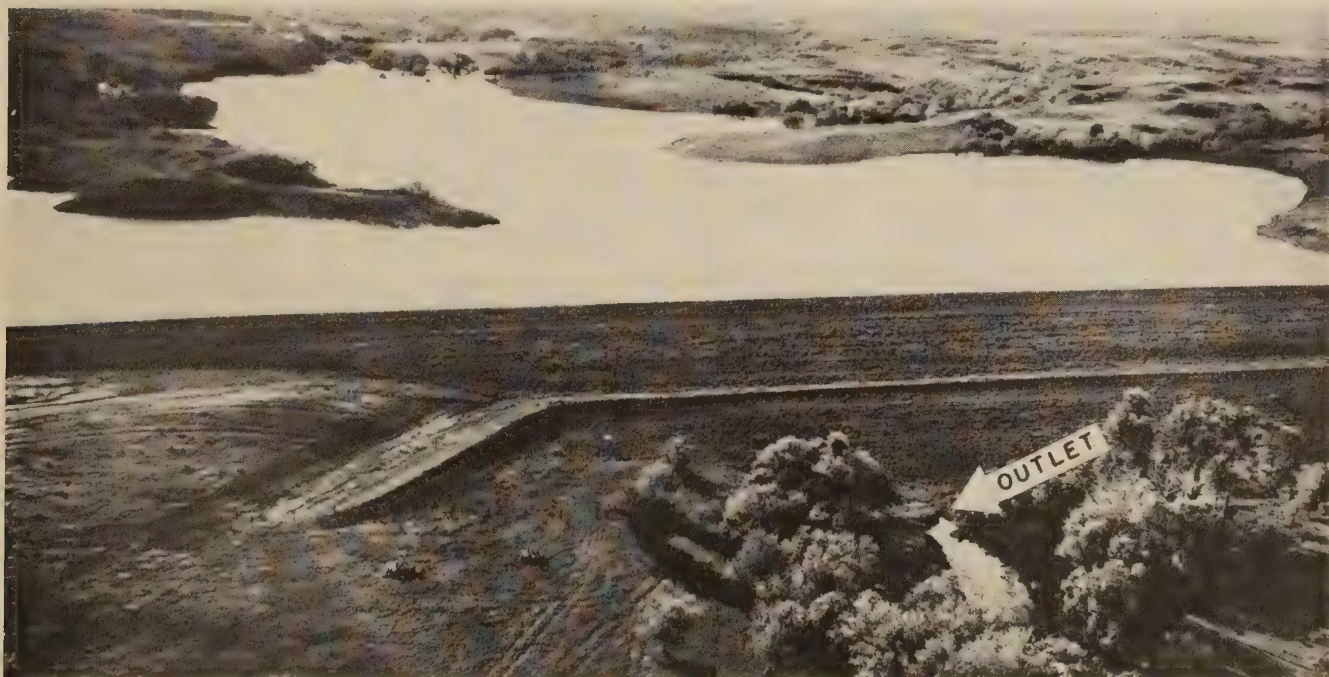
At this time the term, "upstream flood prevention", came into frequent use. It meant the use of soil- and water-conservation measures on a watershed's agricultural land to check part of the runoff and hold soil in place. Then, for the runoff that still might occur, there would be

floodwater-retarding dams designed to release the flow at a rate in keeping with the stream channel's capacity.

One of the reasons the engineering phase of the program could begin without undue delay was the progress that had been made already in land treatment. Soil conservation districts blanketed the entire watershed. Cover cropping and contour cultivation, regrassing of denuded and rapidly eroding areas, use of vegetated waterways to carry runoff from terrace systems, and other conservation practices were already on much of the land. This part of the program was fundamental; not only to do its share in slowing and lessening runoff, but also to safeguard the engineering works by holding down sediment loads borne by runoff waters.

Today, there are 19 soil conservation districts in the Washita watershed. They have formed the Washita Valley Council of Soil Conservation Districts, which has taken over the work of the Washita Valley Improvement Association. The council is made up of one representative from the governing body of each of the 19 districts.

This council recommends to the Soil Conservation Service the priority of all creek watersheds for planning and construction. It also has the job of working with the State Soil Conservation Board in making use of a \$50,000



A floodwater-retarding structure in the Washita watershed empties water from a 6-inch rain through a 24-inch outlet.



Seeding a grass waterway in the Washita watershed.

revolving fund, that the State Legislature provided in 1955, for the purchase of lands, easements, and rights-of-way in situations where local resources might be unequal to the need.

By early 1957, two-thirds of the farmers and ranchers in the Washita watershed were cooperating with soil conservation districts in moving toward a common goal: The use of every acre of agricultural land within its capabilities, and the treatment of each acre according to its needs. Four-fifths of the cooperating farmers and ranchers had developed basic conservation plans. Nearly half of all the soil- and water-conservation measures needed were on the land.

The first studies by the Soil Conservation Service of the Washita's potentialities were on very small segments of the watershed. This was because a small group of interested landowners, with about 5 or 6 thousand acres, could work effectively in doing all the things needed for the flood-prevention job. The first structures, in fact, were installed on a small drainage area. They were built on Cloud Creek, a tributary of Calvary Creek, and dedicated in June 1950.

However, experience soon proved that a more efficient job in both planning and installation could be done on creek-size watersheds; and, the job went ahead on that basis.

Interest was high over the entire watershed. This group or that wanted work to begin in its own area. Landowners generally were ready to

sign easements giving the soil conservation districts authority, without cost, to place the needed structures on their lands.

In late 1950, soil conservation district leaders and SCS officials agreed that an example of a complete installation of upstream flood-prevention measures was needed. They wanted a working demonstration of the principles involved so that all landowners in the Washita and other watersheds could see for themselves just how land treatment and engineering structures work together. They were certain that a fully-treated watershed would show beyond a doubt that this kind of flood prevention would pay handsome dividends.

They chose Sandstone Creek watershed, with a 65,000-acre drainage, on the Washita's western reaches. There were several reasons for picking Sandstone. It had been averaging 9 floods a year with annual damages amounting to \$60,000. A good part of the needed soil conservation treatment had been applied, insuring protection to a practical degree for the engineering structures. And, most important, the landowners and other local people were alert to the opportunity, informed as to the value of this kind of flood protection, and eager to cooperate with their soil conservation districts.

By 1952, the 24 floodwater-retarding dams and the 13 gully-control structures called for in the Sandstone Creek plan, had been installed. Well over half the drainage area had all the soil conservation treatment needed. The land



Native grass pasture on a formerly eroded and abandoned field near Clinton, Okla.

treatment and the floodwater structures repeatedly have saved the bottomlands from severe flooding.

The story of Sandstone Creek, especially since it has had a thorough testing of its flood prevention work, has become a popular one. And the man who no doubt tells the story most often is the Cheyenne banker, L. L. Males, one of the original flood prevention enthusiasts.

Males likes to dwell especially on the contrast between that creek and the others in nearby, untreated watersheds. Sandstone flows almost continuously these days with clear, sparkling water. The big reason, Males points out, is the soil-plant-water program that is at work on almost the entire 65,000 acres.

This banker has told the story, illustrated with colored slides, before many groups, including members of Congress and President Eisenhower.

In the 5-million acre Washita watershed are 64 creek-size watersheds, some of them larger and some smaller than Sandstone. The whole plan calls for 888 floodwater-retarding dams like the 24 in Sandstone. Of these, 155 have been built or are under contract. This is more than one-third of all the floodwater-retarding structures built in the entire 11 flood prevention projects authorized in 1944.

Land treatment scores as well. In the Washita project there are nearly 500,000 acres of contour farming, nearly 200,000 acres of crop-residue management, 227,000 acres of range seeding, and 20,000 miles of terracing. This is one-fourth of all the contour farming now being practiced in the 11 authorized watersheds, nearly one-fifth of the cover cropping, more than a fifth of all the crop-residue management, five-sixths of the range seeding, and more than a third of the terracing.

The land treatment part of the big program has made good progress in spite of the record drouth the region has been experiencing. Planning and design of structures, as well as easements from landowners, are well ahead of money available for construction.

In addition to the large reservoir at Fort Cobb, a second large structure has been authorized for construction by the Bureau of Reclamation at Foss, farther upstream. Its functions, like the Fort Cobb project, will be irrigation, water supply, and flood control.

Six other such reservoirs are listed, in an overall tentative plan for the Washita watershed, for further consideration if and when conditions justify.

But how did the rapid development of up-stream flood prevention on the Washita come about? Why could the Washita program get off to such a fast start while similar projects remained for years in the "tooling-up" stage? The answer goes back to the start of this story, to the efforts of the folks with a vision and a will to try for it. They were the folks like Wray, Wingo, Savage, Church, Males, Cassady, DeWeese and Longmire. They worked hard and long for this panorama that is unfolding in their watershed. They have a right to show a little pride.



SOIL USE AND IMPROVEMENT. By J. H. Stallings. 403 pp. Illustrated. 1957. New Jersey: Prentice-Hall, Inc. \$5.95

THIS is an especially well-written book for use as a text in high school or a reference in soil conservation for vocational agriculture, general agricultural, or Veterans' training courses. Also, farmers and ranchers will find this book valuable.

It is well illustrated with pictures showing the effects of erosion and principles of corrective measures. At the end of each chapter, several good suggested exercises and questions are listed that will be valuable to the instructor and student.

The book is composed of three parts: Part I describes the historical phase of erosion, including the effect of erosion on nations during Biblical times, and the extent of erosion in the United States. Part II deals with the fundamental considerations in conservation, including how water and wind erode soils, soil surveys, land capability classes, and land judging. Part III contains 14 chapters relating to various conservation practices that will reduce erosion, as well as how to plan and establish a conservation plan for farms and ranches.

—B. D. BLAKELEY

DRAINAGE AT CROWHEART

Local, State, and Federal agencies get together to solve seepage problems on irrigated land of the Wind River Indian Reservation.

By JOHN W. McLELLAN

A SEEPAGE problem had existed for years in the Crowheart Area of the Wind River Indian Reservation. It had become progressively worse, until more than one-fifth of the irrigated acreage was affected. Some areas were completely out of production. Many local people were concerned about the problem, but because of its complex nature, nothing had ever been done about it until the Wind River Indian Agency, the Water Users' Association, and the Board of Supervisors of the Dubois-Crowheart Soil Conservation District sat down together

Note.—The author is geologist, Soil Conservation Service, Worland, Wyo.

and decided that something had to be done about the problem.

The area is within the Wind River Indian Reservation. Most of the cultivated land is farmed by white operators who either own the land or lease it from the Indian owners. The white- and Indian-controlled land is so intermingled that an operator's desire to lower a detrimental water table on his unit was subject, not only to his neighbor's wishes, but also, to those of the Tribal Council and Indian Irrigation Service.

Different uses of adjacent land, and the fact that a high water table might hurt one operator while helping another, had stopped any drainage attempt.

In the fall of 1952, Carl Urbigkit, secretary of the Dubois-Crowheart Soil Conservation District, and Gordon Pennoyer, a cooperator and secretary of the Water Users' Association, called a meeting at which many local farmers and representatives of the Wyoming Extension Service, Indian Service, and the Soil Conservation Service were present. A field working agreement evolved from the meeting.



SCS technicians checking the grade of a subsurface-drainage ditch in the Crowheart area.



Floyd Foresman of SCS (left) and Gordon Pennoyer, SCD supervisor, examine the improved stand of desirable grasses after subsurface drainage.

The agreement provided for the Soil Conservation Service to complete conservation plans on the private lands, and provide a geologist to make technical studies of ground water conditions on both Indian and other lands. The Indian Service was to provide engineering help and other assistance during these studies, explain the benefits of the proposed program to Indian owners, and construct the drains that were recommended by the study. The State Extension Service was to make an economic survey of the area and carry out an educational program among the private landowners.

The studies made showed that about 1,500 acres of the 2,000 involved needed drainage, and that the construction of subsurface interception-type drainage ditches was the only practical way of overcoming the "seeped" condition. Exploratory well drilling and engineering surveys proved that ample gradient and suitable outlets existed, along with a drainable subsoil.

While this information was being gathered the Extension Service was making the economic study of the area and conservationists and soil scientists of the SCS were making soil surveys and continuing to develop conservation plans with ranch operators.

All of this information was assembled into a final report and presented to the group in the spring of 1953. The local people and the agen-

cies unanimously decided that the proposed program was feasible and should be carried out.

The Indian Service began construction of the drains in the spring of 1954, and by 1956 had completed three of the main drainage ditches called for in the plan. There was a marked lowering of the water table in these areas. Nearly solid stands of foxtail and dandelions grew before drainage work started. Since the water table was lowered, brome grass and other desirable plants began crowding out the foxtail. The yields on hay fields adjacent to these drains are at least double what they were before. Several hundred acres improved sufficiently to make reseeding of hay and pastureland feasible.

This cooperative effort has been an example to all people concerned in the area of what can be done with a difficult problem by getting together and talking it over.

FIVE GOOD NEIGHBORS.—Idaho soil conservation districts usually are flat broke when they start doing business because they don't receive any public funds from Federal, State, county, or local governments. And they don't assess prospective members; nor are they allowed to go into debt. Somehow they have to make it before they can spend it; and sometimes years pass before they make any money. Very often the members of a governing body, and sometimes the cooperating technicians, dip into their pockets and chip in a few dollars to pay for such operating necessities as postage, stationery, and phone bills.

So it was a real shocker at the organizational meeting of the Salmon River Soil Conservation District when supervisor George Russell had a wad of bills shoved into his official hands before he could take his seat after having been sworn in as treasurer.

It all came about because each of 5 neighboring SCDs chipped in 10 dollars apiece from their treasuries so the "baby" in the divisional group would have something "to go on".

Salmon River SCD embraces 385,000 acres, mostly rangeland. Snake and Salmon Rivers cut through its boundaries, and it is so rugged that you have to travel on foot or horseback to traverse it. The area includes part of the famous Snake River "Hells Canyon". Likewise it is the home of the equally celebrated "Seven Devils" Mountain Range. But, the presence of these characters doesn't worry Salmon River supervisors because they know that at least "Five Angels" are watching over and have much interest in them, and stand ready to lend a helping hand if ever there is need for more assistance.

—HUGH F. EAMES

A PROFITABLE TREE CROP.—A paragraph from the 1956 Annual Report of the Florence Soil Conservation District, S. C., states:

"At the time he developed his farm plan, 5 years ago, a district cooperator proposed to bulldoze a tract of young timber for pasture development. The local SCS technician advised against this and helped plan other land use adjustments to provide sufficient pasture land. Last summer the farmer was offered \$4,000 for the timber above 10-inches in diameter. After consulting the SCS technician, the farmer engaged a forester to mark the trees for selective thinning and then sold on a bid basis. He received \$10,000 for the timber cut, and says he still has more than half the trees left and they are growing more rapidly than ever before."

STRIP MINING.—A cooperative study of the detrimental effects of strip mining on soil, water, and natural resources was started in the fall of 1955 on Beaver Creek Watershed, near Greenwood, Ky. Kentucky's cooperating agencies were the Agricultural and Industrial Board, Department of Conservation; Strip Mining and Reclamation Commission; Division of Flood Control and Water Usage; Water Pollution Commission; and the Department of Fish and Wildlife Resources. Federal agencies cooperating were: Geological Survey; Forest Service; Corps of Engineers; Fish and Wildlife Service; and Soil Conservation Service.

Information obtained from the study will be used to: (1) design reclamation measures that will hold the detrimental effects of strip mining to a minimum; (2) provide data to improve strip mining regulations; (3) estimate size of sediment pool required in future reservoirs; (4) estimate increased costs of treating water supplies for domestic and industrial uses; (5) determine the effects on fish; and (6) test theories on stream geometry.

Studies are being made on 3 watersheds of about 500 acres each. Two of the watersheds are strip-mined watersheds and the third is the control watershed.

A preliminary report on the project was made in May 1956, and will be made annually thereafter during the operation of the project. Preliminary findings and trends will be discussed and basic data released as soon as it becomes available.

Several states have enacted legislation regulating strip mining. Among them are Ohio, Pennsylvania, and Kentucky. In the Act creating the State Strip Mining and Reclamation Commission, the Kentucky General Assembly stated that: "... the unregulated strip mining of coal causes soil erosion, stream pollution, the accumulation of stagnant water, seepage of contaminated water, increase in the likelihood of floods, destruction in the value of land for agricultural purposes, counteraction of efforts for the conservation of soil, water, and other natural resources, destruction or impairment of property rights of citizens, creation of fire hazards, and in general, creation of hazards dangerous to life and property, so as to constitute an imminent and inordinate peril to the welfare of the Commonwealth."

AIRCRAFT IN AUSTRALIAN AGRICULTURE.—During the 3 month period ending June 30, 1956, airplanes were used to treat 116,000 acres of pasture in New South Wales, Australia. Nearly 8,000 tons of phosphate fertilizer and 50,000 pounds of clover seed were applied to 102,000 acres by airplane. About 14,000 acres of pasture were treated with herbicides and insecticides. In addition, around 65,000 acres of other crops were treated with herbicides and insecticides by planes.

—*The Agricultural Gazette,
Sydney, Australia.*

EGYPTIAN AGRICULTURE.—With a population of about 23 million, Egypt has only 6.2 million acres along the banks of the Nile and its delta that are available for cultivation. Yet, the production and processing of farm commodities account for about 60 percent of the national income and nearly 90 percent of Egyptian exports.

WHERE DID THE RABBITS GO?—The Cooperative Wildlife Research Unit at Iowa State College completed a study on a 185-acre farm to find out whether rabbits actually disappear in the fall as fast as hunters think they do.

On September 1 there were 284 rabbits on the farm. By December 31, only 41 of these rabbits remained. In the meantime, hunters had killed only 10 rabbits.



